SCIENTIFIC AMERICAN

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STEAM DUMPING SCOW FOR THE STREET CLEANING DEPARTMENT OF NEW YORK.

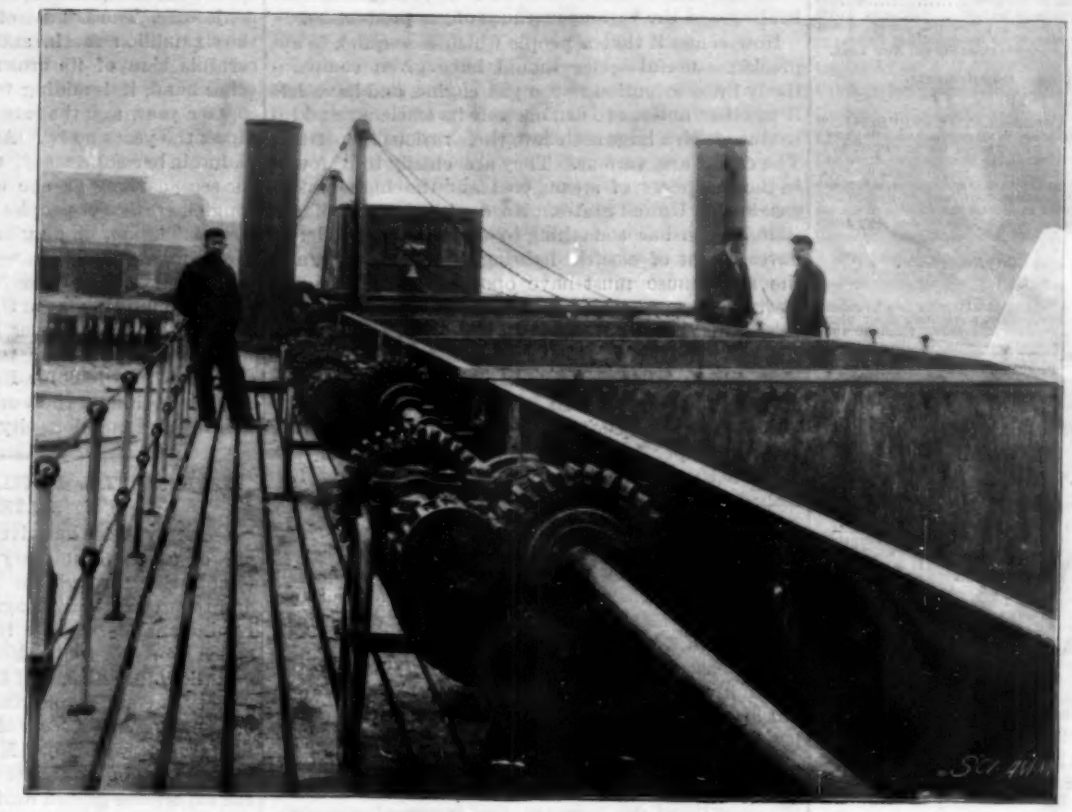
The Street Cleaning Department, of New York City, as at present administered, is a notable instance of what good results may be gained by a thorough reform in a much abused branch of city government. It is but a few years ago that the condition of the streets of New York was a reproach to the city and a daily menace to the health of its inhabitants; but to-day, thanks very largely to the energetic reforms and administration of Colonel George E. Waring, the chief commissioner, the streets of New York compare favorably with those of the best managed capital cities of the world.

The operations connected with the daily sweeping of the hundreds of miles of streets in this great city and the daily collection and carting away of the ashes and garbage from the homes of two millions of people are on a vast scale and involve the employment of a little army of laborers. There are altogether some 2,500 employes in the department, and of this total about 1,600 are sweepers, 800 are drivers and 100 are supervisors and clerks. The "Uniformed Force" is controlled by a superintendent, under whom are an assistant superintendent, a superintendent of stables, eleven district superintendents, and in each district there are five or six foremen. There are nine stables distributed throughout the city, and there are fifteen "dumps" located at convenient points on the Hudson and the East Rivers.

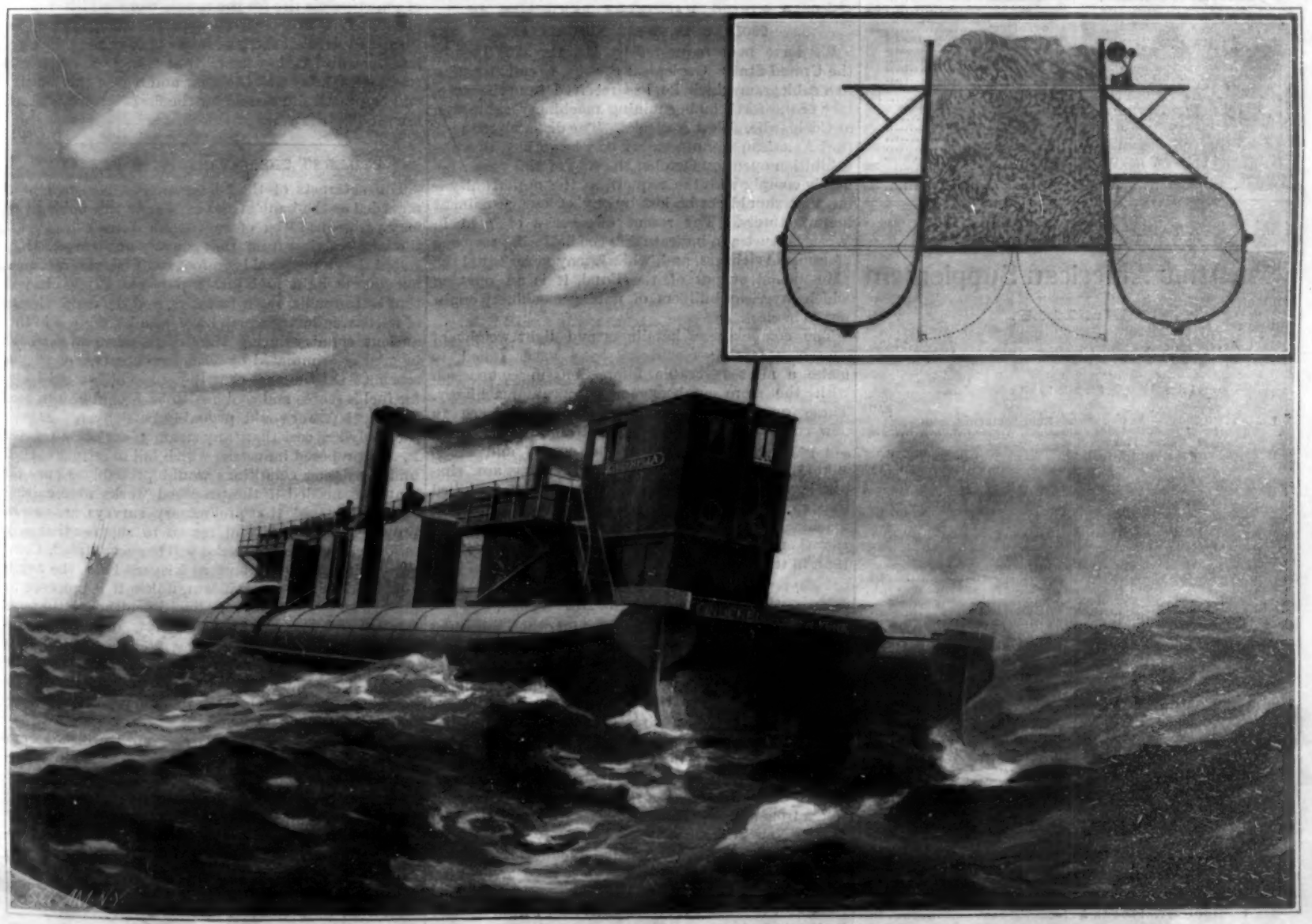
The sweepers are paid $50 a month the first year, $55 the second year, and $60 the third year, and the third year men are eligible for promotion to the position of district foremen.

Under the present sys-

(Continued on page 359.)



PLATFORM DECK SHOWING THE POCKETS AND THE DUMPING GEAR.



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Capacity, 600 cubic yards of refuse; speed, 10 knots an hour.

Scientific American.

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NEW YORK, SATURDAY, JUNE 5, 1897.

Contents.

(Illustrated articles are marked with an asterisk.)

A. A. A. S. Detroit meeting..... 355
African travels, Miss Kingsley's*..... 361
Bicycle frame improvement, Pinover's*..... 356
Bicycle trip, another army..... 354
Boiler explosion, peculiar*..... 357
Books, new..... 364
Boys and girls, timidity of..... 357
Colors to be used judiciously..... 357
Cowboy, the South American..... 359
Dumping scow for N. Y. City*..... 355
Engineers' Society meeting..... 355
Fire engine valve, valuable patent on*..... 356
Fog and photography..... 356
Gas engines in the U. S..... 354
Guns, improved rapid fire*..... 360
Inventions recently patented..... 364
Leipsic exhibition, the..... 356
Maxim guns, three types of*..... 360
Mining machinery exhibition, Australia..... 354
Meteorology in Persia..... 356
New York, "Greater"..... 354
Nile cataracts, utilizing the..... 354
Notes and queries..... 364
Patent infringement, large award for*..... 356
Patents granted, weekly record of..... 364
Peary expedition, the new..... 355
Photography and fog..... 356
Science notes..... 362
Spain, distress in..... 359
Spider's thread, size of a..... 359
Street cleaning dumping scow*..... 353
Tornado drills, Kansas..... 355
Thames tunnel, the new..... 355
Tower, oscillations of a..... 362
Truth and the trusts..... 360
Washington monument, Philadelphia..... 362
Wood pulp, increasing demand for..... 356

TABLE OF CONTENTS OF

Scientific American Supplement

No. 1118.

For the Week Ending June 5, 1897.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ARCHÆOLOGY.—The Casa Grande Ruin, Southern Arizona.—By COSMOS MINDELEFF.—2 illustrations..... 17867

II. CIVIL ENGINEERING.—Thirty Ton Steam Traveling Crane.—1 illustration..... 17866

III. GEOLOGY.—Sixty Years of Geological Research.—An important historical resume of this most important period in the history of geology, with a portrait of Sir Charles Lyell.—2 illustrations..... 17875

IV. MECHANICAL ENGINEERING.—Launch Engine.—A description of a petroleum vapor engine.—3 illustrations..... 17865
Electricity Versus Shafting in the Machine Shop.—By CHARLES H. BENJAMIN, Cleveland, O.—A full article giving details of the use of electric current and the economy of the system..... 17871

V. MEDICINE.—The Value of Pathological Research.—An important address by Lord Lister, president of the Royal Society..... 17874
Bees in Medicine..... 17870

VI. MILITARY ENGINEERING.—Army Signaling and its Use in War..... 17864

VII. MINING.—Note on Swedish Statistics..... 17868

VIII. MISCELLANEOUS.—The Greek and Turkish Fleets.—A full account of the fleets of the Greek and Turkish nations, with biographical notices of Osman and Edhem Pashs, generals of the Turkish army.—4 illustrations..... 17864
Engineering Notes..... 17869
Electrical Notes..... 17869
Miscellaneous Notes..... 17869
Selected Formulæ..... 17870

IX. PHOTOGRAPHY.—The Photo-Stereoscopic Field Glass.—3 illustrations..... 17868

X. RAILWAYS.—Estimates of Siberian Railroad Traffic..... 17866
Serpollet's Automobile Railway Cars.—2 illustrations..... 17867
Siberian Railroad Extension in China..... 17867

XI. STEAM ENGINEERING.—Apparatus for Sending Water of Condensation Automatically into Boilers.—1 illustration..... 17865

XII. TECHNOLOGY.—Fluid Air for Industrial Uses..... 17870

XIII. TELEPHONY.—The Berliner Telephone and Transmitter Patents.—16 illustrations..... 17869
The Berliner Transmitter Patent.—A continuation of this most important decision which affects vast interests..... 17873

THE GAS ENGINE INDUSTRY IN THE UNITED STATES.

It is a noticeable fact that although the gas engine industry has been advancing with rapid strides in England and on the Continent, it has made comparatively slow progress in this country. This is said with the knowledge that gas engines as well designed and as efficient as any in the world are built in the United States, and the statement is intended to apply chiefly to the development of the trade. Visitors to the recent gas exposition in New York must have noticed that although a few excellent types were shown, the gas engine, as such, was conspicuous by its absence. This may have been due, however, to the fact that the exposition was devoted chiefly to lighting and heating and the various methods of gas production.

How comes it that a people which is so quick to appreciate a useful device should have given comparatively little attention to the gas engine, and have left it to other nations to demonstrate its efficiency and introduce it on a large scale into their various industries? The causes are various. They are chiefly to be found in the cheapness of steam coal and the high cost of gas in the United States. No doubt the cost of gas illumination has something to do with the wonderful development of electric lighting in this country, and the same cause must have operated to develop the electric motor as against the gas engine. That the price of gas must have exerted a powerful influence on the gas engine industry is rendered probable by a comparison of the prices paid here and in England. The city of Manchester, which has about the same population as the city of Boston, sold its gas in 1893 at the rate of 60 cents per 1,000 feet; and the consumption was 3,636,000,000 feet, or more than the total amount furnished by the whole State of Massachusetts, where the gas costs on an average $1.50 per thousand feet. In Newcastle-on-Tyne the users pay only forty cents a thousand feet, and when we bear in mind that makers are building engines which they will guarantee to use only 20 cubic feet per hour, the popularity of this form of engine in England is largely explained.

It is reasonable to suppose that when this industry, which in respect of its proportions is yet in its infancy, has attained the importance which it has in Europe, it will tend to reduce the price of gas, especially such gas as is used for cooking and power purposes; and the gas companies, themselves, will undoubtedly benefit by the growth of the industry, the increased consumption more than compensating for the reduction in price.

GOLD MINING MACHINERY EXHIBITION AT COOLGARDIE, WEST AUSTRALIA.

We have been requested by Mr. David T. Day, of the United States Geological Survey, to call attention to a cablegram which he has received from the secretary of the forthcoming mining machinery exhibition at Coolgardie, West Australia. The dispatch requests that American manufacturers may be notified that the exhibition opens on October the first of this year. We gladly comply with the request, as the opportunity is one that should not be lost by any of our prominent manufacturers. The recent discoveries of gold in Western Australia indicate that the field will prove one of unusual richness, and, while it may never equal the phenomenal output of the Rand, it is an opening which American builders of mining machinery ought not to neglect.

The compactness, handiness and light weight of American mining machinery have never failed to make a most favorable impression in comparison with the more cumbersome European machinery. These qualities are of the first importance in new countries like Western Australia, where roads are poor and transportation is costly, and accessibility, simplicity and ease of repairs are simply invaluable qualities in the too often unskilled hands of the miner. It is necessary that the actual machinery should be exhibited. In such a case as this there is more virtue in a pound of exhibited material than in tons of printed circulars.

THE SECOND CITY IN THE WORLD.

Now that the city of Brooklyn and other suburban districts have been incorporated with the city of New York, the latter in point of population easily takes rank as the second greatest city of the world. London, of course, comes first with its great total of 5,600,000 souls. New York, or "Greater New York" as it has been popularly called, contains fully three and a quarter million souls, or three-quarters of a million more than Paris, which has heretofore ranked as the second city to London in point of size. The above estimate is taken from an interesting article on Greater New York in the New York Times. The property valuation is $4,559,600,000 and the bonded indebtedness is $205,559,317. The city boundaries inclose a total area of 360 square miles, the extreme length being 32 miles and the width 18 miles. It is estimated that within the city limits there are nearly 300 miles of water front, 1,000 miles of railways and 2,800 miles of streets and roads. These figures are the more remarkable if we remember that they represent practically the growth of a single century, for the census of 1800 shows that New York had then only 60,489 inhabitants, and it is certain that Brooklyn with the other districts recently included would at that time have made but a slight increase in the total. As to the future there is no reason to suppose that New York will ever lose its present position. There is no other city, unless it be Paris, that can be considered as a rival for second place among the great cities of the world, and the comparative youth and vigor of the country that is tributary to New York render it certain that her rate of growth will be greater than that of the French capital.

As to the possibility of the capital of the western hemisphere becoming the capital of the world it is difficult to conjecture. The London of to-day will soon have passed the six million mark, and there is at present no discernible sign of its growth being arrested. On the other hand, it is adding to its numbers at the rate of 80,000 a year, and the rate of increase is steadily growing as the years go by. As long as England is able to maintain her supremacy, naval and commercial, upon the seas, as long as she can hold together that huge conglomeration of peoples and countries known as the British Empire, binding them to the mother isle with the strongest of all bonds—those of commercial interest—London will continue to grow and its people and wealth to multiply as in the past. Should the dissolution of the empire ever be brought about, and the world's commerce cease to pulsate from London as its center, we may look for New York to take rank as the chief emporium of the world and ultimately as its most wealthy and populous city.

EXPERIMENTAL BICYCLE TRIP IN THE UNITED STATES ARMY.

Secretary Alger has given permission for the carrying out of a second military bicycle trip, similar to the famous ride through the Rocky Mountains last year, and the expedition will again be under the charge of Lieutenant Moss. The route has been laid out between Fort Missoula, Montana, and St. Louis, Mo., and the total distance of 3,000 miles will include every variety of country and roads. The party is to consist of a surgeon and a score of privates from the Twenty-fifth Infantry at Fort Missoula. A special military bicycle is being built, the design of which is based on the experience gained during last year's trip. The experiment will possess special interest for the bicycling world in general, for it will be one of the objects of Lieutenant Moss to determine which is the best form of punctureless tire for the rough work which will be encountered. For this purpose the company will be furnished with all the best forms of so-called punctureless tires, and it is certain that the tires which can stand reasonably well the wear and tear of this journey will be practically perfect for the first-class roads which are used by the average wheelman.

UTILIZING THE CATARACTS OF THE NILE.

The cataracts of the Nile, which have always been regarded as the bane of navigation on this noble river, may yet prove to be of inestimable benefit to Egypt if the latest advices from that country are correct. It is stated that a proposal is on foot to utilize the cataracts for electric light and power purposes. It is claimed that cotton mills, sugar factories, and the various forms of western industry which have been introduced in this ancient country during the British occupation would be greatly stimulated by the carrying out of such a scheme. On the face of it the proposal is a good one, for fuel is scarce and coal has to be brought in by sea. Electrical power could probably be delivered at considerably less cost than any steam plant could furnish it, and proposed industries which fail to attract capital under existing conditions would probably secure all that was needed if the proposed works were carried out. It is stated that preliminary surveys are now in progress, and there is no reason to suppose that any serious engineering obstacles will be encountered. Compared with our own plant at Niagara Falls, the available head will be insignificant, unless it is proposed to put in a long and costly pipe line. For although the term cataracts conveys the idea of a very sudden fall in the river, as a matter of fact these stretches of the Nile are more of the nature of rapids than cataracts, as may be judged from the fact that river steamers have been hauled against and through them in recent British expeditions up the Nile.

If the proposed work is carried out, it will work another and important step in the recovery of this historic land from the degradation into which it had fallen under Turkish misrule. The civil engineer has done and is doing a splendid work in the ancient land of the Pharaohs, and whatever political changes may be in store, it is to be hoped that nothing will occur to prevent its present conquest by the transit and level.

MUNICH breweries possess 1,263 freight cars in which their beer is taken to all parts of Europe, including Spain, Italy, Turkey, and Russia. Erlangen breweries have 47 cars, Kulmbach 180 and Nuremberg 96.

THE NEW PEARY EXPEDITION.

The application of Civil Engineer R. E. Peary for five years' leave of absence to continue his Arctic exploration was granted on May 26 by Secretary of the Navy Long, and Mr. Peary will now be detached from duty at the Brooklyn navy yard. Mr. Peary said that no arrangements for his approaching voyage had as yet been made. Preliminary to the polar expedition which Mr. Peary outlined at the American Geographical Society, on January 12, he will make a trip to Whale Sound on the northwest coast of Greenland, where he has friendly relations with the Eskimos. He will take some of these people north with him, and after his visit next summer they will have a year's time to prepare for the expedition and to have furs and provisions in readiness when the expedition arrives. Mr. Peary said: "I shall start on my preliminary voyage about July 10. The expedition will meet the ship at Boston. Several scientific parties will accompany me; there will probably be three parties in all. One will be in charge of Prof. O. H. Hitchcock, of Dartmouth College, and Prof. George H. Barton, of the Massachusetts Institute of Technology, will probably command another. These parties will land on the coast of Labrador, Baffin Land and Greenland. I will return for them on my way home from Whale Sound. The expedition will return in the latter part of September."

A year from the coming July Mr. Peary proposes to start on the main expedition. It is impossible to say how long this will consume, possibly two years and probably not more than four. The expedition will be different from most Arctic expeditions in that the only civilized members of the party will be Mr. Peary and a surgeon. Mr. Peary has decided this question after considerable deliberation.

Mr. Peary says: "Leaving the ship at Whale Sound, with about six families of Eskimos, who will meet me there, I shall push up the coast until I reach Sherard Osborne Fjord, in about latitude 81°. Here I shall establish a colony and a base of supplies. Between this colony and Whale Sound I shall keep a constant line of communication by means of dogs and sledges. The site of this colony I expect to reach in the latter part of August or early in September. Several months will be consumed in collecting supplies.

"The dash for the pole I shall start on about March. We shall push on till we find the termination of Greenland, and from there our path will be across the ice. We shall take all our supplies with us on sledges. How far the land extends to the north no one knows, and this I hope to find out.

"The route which I shall pursue on this expedition is what might be called the 'American route,' owing to the preference which American travelers seem to show for it. I think it preferable to other routes because of the existence of land so much further north. When there is land for a base then there is some fixed point to return to, and depots can also be established as one advances. Nansen has proved how unreliable a ship is as a basis, owing to the tendency of the drifting ice to carry her hundreds of miles from where she was left. The Eskimos can always be relied upon along this route for what I propose to do. Nansen's furthest north was 86° 14'. I hope to advance beyond this and if possible reach the pole. How long it will take I cannot say. I will say, however, if I fail I shall try again."

It is regrettable that the request of a leave of absence for Mr. Peary has been opposed by certain elements in the navy, which pointed to the action of Secretary Herbert last summer in refusing to grant a two years' leave of absence to Mr. Peary to make the same proposed trip. This element asserts that if Mr. Peary wishes to make another Arctic trip he should resign from the navy. We do not see how an officer of the United States navy could be better employed than in making such remarkable explorations as those of Mr. Peary. Civil engineers are common enough, but successful Arctic explorers are rare. Powerful scientific influences were brought to bear in Mr. Peary's behalf, and the order of Secretary Long leaves nothing to be desired.

TORNADO DRILLS IN KANSAS.

In the East we have fire drills in our public schools, and on more than one occasion they have proved to be very effective in an emergency, but in Kansas they have a drill of another kind, for their tornadoes are more to be dreaded than fire, and school children are now being trained in tornado drills. When the tornado strikes a Kansas town the inhabitants at once make for the prairie. It is almost the only way to escape death from the flying debris of houses, falling trees and toppling buildings. The school children are trained to know this, and on these occasions rush pell mell for the nearest bit of clear prairie; but many children have been maimed and some killed in these terrible storms. There has been a movement started throughout the State to have tornado caves built under the school houses, large enough to accommodate all the children while the blow lasts. The tornado drill is very much like a fire drill. The teacher sounds the alarm on a piano and the children stand up; then a march is played and out they go in good order, down the stairs and into the tornado cave. If the entire building falls into ruins, the children are safe in the tornado-proof cave.

THE LEIPSIC EXHIBITION.

The Leipsic Trade and Industrial Exhibition, opened by the King of Saxony on April 24, proves, in respect to readiness and completeness, no exception to its predecessors. Judging, however, from present exhibits, the undertaking, excepting some very few branches of industry, like the rubber trade, bids fair to be the most important Europe has witnessed for many a decade. The machinery exhibit is far richer than at the late Berlin exhibition.

The exhibition covers an area of more than 400,000 square meters, and is on reclaimed ground belonging to the city. The guarantee fund amounts to 2,000,000 marks—rather a moderate sum compared with the magnitude of the undertaking. For Americans, the exhibition will be found exceedingly instructive, the display of surgical instruments and carriages being remarkable. The latter exhibit shows how quick the Germans are to learn of other nations, especially of the United States.

The main entrance, in white and green, the Saxon colors, is in the form of a segment of a circle, flanked by two needlelike pyramids. The lay of the grounds and the long vista from the main entrance to the main building are on the same lines as those of the Berlin exhibition, although lacking the grandeur of the latter.

To the right of the main entrance is picturesque "Old Leipsic," or, as it is called here, the "Fair Quarter," a most careful and interesting reproduction of this quarter of the city 400 years ago. The antiquarian will distinguish the old Rathhaus or town hall; Auerbach's Cellar, immortalized by Goethe in his Faust; the old citadel, the Pleissenburg, at present undergoing demolition to make way for the new City Hall; the old scales and debtors' tower. To make the illusion complete, all the attendants, waiters and waitresses are dressed in the costume of those days. A large statue of the Emperor Maximilian, who in 1497 conferred on Leipsic the privileges of the fair, still held every year, stands at the entrance to the Rathhaus.

The Horticultural Hall, the next building we come to, covering an area of 2,500 meters, is partly laid out in very tasty grounds, where the profusion of roses and other flowers is uninfluenced by the cold night air without, and the delicate flowers can thrive without being retarded in their growth by changes of the weather. A South American landscape, very ingeniously arranged with regard to perspective, attracts all eyes. A ram's head over the entrance to the next building informs us that we are at the Textile Exhibit, which is more backward than any other department here represented except cycles, the goods not even having been unpacked. The exhibit is, however, according to all accounts, destined to do full credit to this Saxon industry, which will be referred to later. A large building, still rather empty, will be devoted exclusively to lighting apparatus, more especially to incandescent lighting, so much in vogue in Germany. We now cross the electric belt railway, and passing through the entrance to the medieval Castle Lauffers, which is to contain the Alpine Panorama, we emerge into the main avenue. Leaving behind us the great main building, covering an area of 23,500 square meters, we pass on our left the large building containing the sausage factory of Nietschmann, besieged day and night by hungry crowds, and come to the building containing the very interesting exhibit of the city of Leipsic. Adjoining the latter is the Kunsthalle or Art Gallery, containing the works of some 600 artists. Opposite, on the other side of the pond, is the spacious building destined to contain the Cycle Exhibit, of which at present there are only meager traces. Next door is the Main Restaurant, the resort of the upper ten. Branching off here, from the main avenue, we reach the square, encircled by buildings, the aim of whose proprietors it is to provide for the wants of the inner man. All the great German breweries are represented here. At one corner we are offered cooling American drinks, from another the strains of a mandolin and Italian gondolier's song invite us to take a peep at the warmer blooded Southrons. Paying toll at the entrance to the old bridge, vividly reminding us by its primitive construction of the covered bridges of New England, we enter the Thuringian Village, one of the most delectable sights of the exhibition. Everything is true to life, the very houses having been taken to pieces and set up again here. The Old Mill, the country inns, the dance on the green, the bleating of the sheep, and, above all, the pretty little village church and beautiful cloisters, all enchaining us to this cozy spot. Leaving the village, we have finished the round and are now at the main building, the rich contents of which must be reserved for another article. The various articles exposed by the 3,500 exhibitors will reward us for the time spent upon them.

FOG AND PHOTOGRAPHY.

The most important feature of the remodeling of his studio by M. Lafayette, the well-known photographer, is the arrangement by which the studio is cleared of fog—one of the most deadly enemies of the camera. To put the case simply, the difficulty which has to be met is the freeing of the atmosphere from the foreign opaque substances which it has absorbed, and which break up the rays of the electric light, nullify its penetration and are themselves photographed in the front of the sitter. The system in question gets rid of these opaque impurities by keeping the fog out of the studio in the first place, and secondly by thoroughly drying the air inside, and so precipitating the solids which obscure it. Artifice gives you the transparent air of Southern skies, says the English Mechanic. The artifice in this case is represented by a warming and ventilating apparatus and may be best explained as follows: Starting at the air inlet, where the fresh air is admitted into the building, there is a specially constructed filter through which the air must pass, and in so doing be freed of its impurities. It is then drawn through a warming apparatus composed of coils of steel steam piping completely cased in a sheet steel casing, thereby eliminating all risk of fire. These heating coils are supplied with steam from a low pressure steam boiler, which is so arranged in relation to the heater that the steam flows automatically from the boiler to the heater, and the condensed water returns automatically to the boiler.

The air having been purified and warmed to about the heat of a summer atmosphere, is then passed through an electrically driven fan and conveyed to the different parts of the building by sheet iron ducts, the sizes of these being carefully proportioned, so that an equal distribution of warm air is obtained over the entire building. The fresh air enters the room near the ceiling, and the top of the room acts as a reservoir into which the fresh air is introduced, and whence it is gradually dispersed over the whole room, doing away entirely with draughts. The vitiated air is drawn out through outlets at the bottom, and both inlets and outlets are fitted with louver registers, so that they can be regulated at will. In hot weather the fresh air is brought into the building, filtered, passed through a cooling chamber, and taken over the building in a like manner, and thus both in winter and in summer the warming, cooling, and ventilation of the building is under entire control.

THE NEW THAMES TUNNEL OPENED.

The new tunnel under the Thames, Blackwall, London, was opened on May 22. In the procession was the Prince and Princess of Wales, the Duke of York, Duke of Portland, engineers and many invited guests. The procession started in the West End, going through Pall Mall, Northumberland Avenue, the Embankment, Queen Victoria Street, thence through Whitechapel to the entrance of the tunnel. The procession then proceeded through the tunnel, which was illuminated by three rows of electric lights. At Greenwich there was erected a dais upon which the members of the royal party took their places and from which the Prince of Wales, in the name of the Queen, declared the tunnel open to public traffic. The state trumpeters blew a blast, the royal salute was fired by the Artillery Company and the Bishop of London pronounced the benediction. The Prince of Wales was then presented by the committee with a gold medal, struck for the occasion.

THE DETROIT MEETING OF THE A. A. A. S.

The American Association for the Advancement of Science will meet at Detroit, Mich., August 9 to 14, and arrangements for the entertainment of the members are well in hand. The Hon. Thomas W. Palmer, the well known World's Fair executive, is acting as chairman of the general and finance committee. The new high school building, with a good auditorium and rooms for the meetings of sections and committees, affords ample accommodation for the American Association and allied societies. The citizens of Detroit have seconded the invitation of the American Association inviting the British Association to meet in that city the week preceding their meeting at Toronto, and it will be the endeavor of the citizens of Detroit to extend the same courtesies to the foreign body as to the American Association itself.

ENGINEERS' SOCIETY MEETING.

The regular monthly meeting of the Engineers' Society of Western Pennsylvania was held in the lecture room of the society's house, 410 Penn Avenue, Pittsburg, Pa., on May 18, 1897, at 8 P. M.

The paper, "High Frequency Currents and X Rays," was by Mr. H. W. Fisher, and was copiously illustrated by electrical experiments.

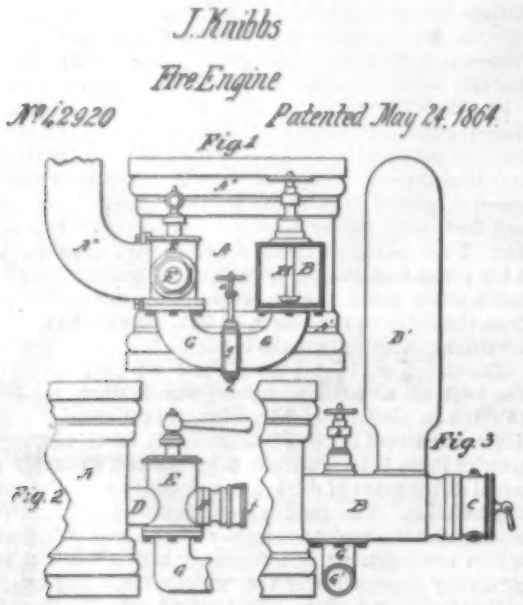
A great number of phenomena of high frequency currents were shown and a very powerful X ray apparatus was operated, by which the beating of the heart, etc., could be seen.

The attendance was very large and appreciative. The discussion at the close was participated in by Messrs. C. F. Scott, John Brashear and others, who highly complimented the lecturer on his presentation.

AWARD OF OVER $800,000 FOR INFRINGEMENT OF KNIBBS FIRE ENGINE PATENT.

The United States Court has rendered judgment against the city of New York in favor of Christopher J. Campbell for infringement of a patent granted as long ago as May 24, 1864. The verdict allows the plaintiff the large sum of $818,074.32, and it marks the latest step in a famous suit which has already been dragging its weary way through the courts for nearly thirty years, and is likely to be in litigation for several years to come if, as is stated, it is the purpose of the city to carry the case to the higher courts.

The patent was granted to J. Knibbs and bears date



FACSIMILE OF DRAWINGS IN ORIGINAL PATENT.

May 24, 1864. It has generally been known as the Knibbs relief valve; though the term does not adequately describe the device, as may be seen from the wording of the first claim: "The returning of any excessive water in the force part or section of a steam, fire or other engine pump to the suction part or section thereof." Knibbs later assigned his right to C. J. Campbell. In 1865 the New York Fire Department fitted the valve to thirty-three fire engines, and the success of the new device may be judged from the fact that by the close of the year it had been fitted to every fire engine in the city.

There was a dispute with Campbell as to the proper amount to be paid for the use of the patent, the city claiming that the sum demanded was out of proportion to the value of the patent. Suit was instituted in the State Court, and after a few years' litigation it was carried, on November 24, 1877, to the United States Circuit Court. Here, after years of further litigation, Campbell's claim of exclusive right in the patent has been sustained and an accounting of profits by the city in the use of the valve has been ordered.

We present in the accompanying engravings, Figs. 1, 2, 3, a facsimile of the drawings accompanying the Knibbs patent, and also Fig. 4, a drawing showing a Knibbs valve and return pipe, as fitted on one of the New York fire engines to-day. Figs. 5 and 6 represent an improved valve of the Knibbs type in which the opening of the valve is performed automatically by the pressure of the water. The latter is frequently fitted

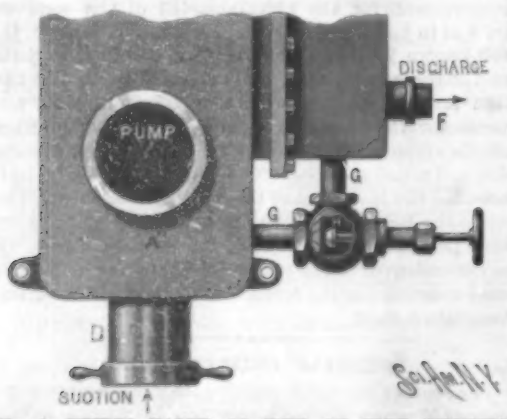


Fig. 4.—KNIBBS VALVE AS USED ON FIRE ENGINES TO-DAY.

on the same engine as the hand-worked valve, and the two valves are used to about the same extent in the New York Department, though there are some cities in which the simple hand valve is in exclusive use.

The object of the Knibbs device was to enable the pump to be kept running at full speed independently of the number of hose pipes through which it was discharging. The specification states that great difficulty had been experienced when it was necessary to shut off some of the hose pipes attached to the discharge; for either a waste water valve had to be opened, which resulted in the streets being flooded, or, if this were not done, "the pump would become somewhat strained and flooded." Knibbs conceived the ingenious idea of throwing the surplus water back into the suction pipe, and he carried it out by means of the simple device shown in his drawings, which consists of a short length of pipe connecting the discharge with the suction pipe, in which is placed a simple hand-worked throttle valve.

In the drawings Fig. 1 is a front view of the pump cylinder, showing the suction and the delivery pipes; Fig. 2 is a side view of the delivery, and Fig. 3 is a side view of the suction pipe. A represents the pump cylinder, B the suction pipe, D the delivery pipe, and E is the valve for closing the discharge. The suction hose is attached at C and the discharge hose at F.

The above parts were similar to those in use before Knibbs entered the field. His invention consisted in connecting the discharge and suction by a short pipe, G, and placing a throttle valve, H, at the point where G enters the suction pipe, B. This valve, it will be seen, gave the engineer complete control of the pressure in the hose pipes. When all the pipes were in use, H was closed. If one or more hoses were suddenly shut off, H was opened and the surplus water was allowed to flow back into B. If all the hose pipes should be shut off, H would be completely opened, and the water was simply rotated, or "churned," as the firemen call it, passing through the pump and being returned by the pipe, G.

The advantages of the device are obvious, and it has proved so effective that it remains in use practically unaltered to the present day. This will be evident by reference to Fig. 4, which shows the Knibbs valve as fitted to a modern New York fire engine. In this case, F is the discharge and B the suction, and the Knibbs "relief" or "churning" device is represented by the short pipes, G, and the elbow valve, H.

Ordinarily the engineer can tell when a hose has ceased taking water by the rise in pressure, but not always. The rise may be occasioned by the hose getting jammed, and therefore it is necessary and customary to send word to the engineer when a hose is shut off. To insure a prompt action of the Knibbs valve, the ingenious improvement shown in Figs. 5 and 6 has been brought out and is now in extensive use. Fig. 5 is a cross section of the pump, and it will be seen that the valve, A (answering to valve, H, of the other drawings), is seated in the wall or diaphragm which divides the suction from the discharge. The valve stem, B, passes out through a hollow cylindrical shaft which is firmly screwed into the cylinder wall of the pump on the discharge side, and at its outer end B is screwed into an outer cap, C. The cap, C, is connected by an intermediate sleeve, D, with an inner cap which rests at E upon the flange of the fixed portion of the valve. A powerful coil spring bears at one end against a ring at the upper end of the hollow shaft and at the other end against the inner cap above mentioned. By turning the sleeve, D, the valve, A, may be kept down upon its seat with the required pressure. The water is free to pass up the hollow shaft, but is prevented from returning on the outside of it by a rubber packing ring, as shown. The water being free to press upon the inner faces of A and C, it will have a tendency to lift C, and therefore A, with a pressure due to their difference of area. This is prevented and the required pressure in the water is maintained by turning the sleeve, D, until the proper tension is put upon the spring. If one of the hose pipes be closed by the firemen, the increased pressure on C will cause A to lift and will allow the water to pass from the discharge to the suction. When all the nozzles are again in use, the pressure will drop and the valve, A, will close.

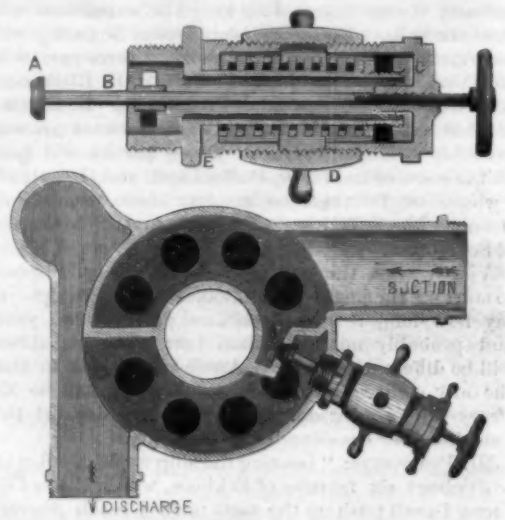
In the controversy with Campbell the city does not deny that it is using and has been using the Knibbs patent; its contention is that the compensation asked is excessive. On this point there may be various opinions; but we think that, in view of the extreme usefulness of the invention, the vast saving it has made in preventing the wetting of goods by the excess water, and the many years during which the city has had the benefit of its use, the award of Judge Wheeler will not appear to be by any means excessive.

In conclusion, we would draw attention to the fact that the second claim of the patent is all-embracing and covers in very simple but comprehensive terms the idea of the patentee. It is as follows: "The connecting of the discharge or force part or section of a steam, fire or other engine pump to and with the suction or supply section thereof by means of the tube, GG, and the regulating valve, H, or any equivalent therefor."

Meteorology in Persia.

Letters which have reached us from Bushire, on the Persian Gulf, dated January 9, and containing news which has not yet reached the London press, show that the Persians are not at all disposed to lay all the blame of the drought on Providence. Their want of fatalistic consideration has almost created an international incident. The agricultural population of the Bushire district, annoyed at the want of rain, turned their wrath upon the European Telegraph Department and especially upon some landmarks which had been erected by Lieutenant Cunningham, R.E., about two years ago, on account of the Meteorological Survey of India. To these obnoxious landmarks the deficient rainfall was ascribed. The Superintendent of Telegraphs, besieged in his office by a threatening mob, at once wired to the Resident that affairs were critical, and H. M. S. Sphinx and the steamer Lawrence were ordered at once to Bushire.

Stimulated by this apparition, the governor dispatched troops with a gun against the rioters; but too late, alas! to save from destruction the casus belli, the survey pillars, the erection of which had so exasperated the heavenly powers. Strange to say, heavy rain fell in Bushire and the neighboring district on January 6, so that the people are convinced of the correctness of their suspicions and their action. The ringleaders are less certain; for about twenty of them were soundly



Figs. 5 and 6.—AUTOMATIC FORM OF KNIBBS VALVE AS USED TO-DAY.

bastinadoed by the governor to impress upon them the fact that there is no advantage in propitiating the heavenly authorities unless the earthly powers have been also effectively "squared."—London Standard.

A BICYCLE FRAME IMPROVEMENT.

In bicycle frames made of wood, the different frame members being joined by metal sockets, difficulty has sometimes been experienced from the ends of the frame members becoming loose in their sockets, and to obviate this trouble the improvement represented in the accompanying engraving has been patented by Alex. Pinover, of Nos. 42 and 44 East Houston Street, New York City. Fig. 1 is a sectional view of a portion of a frame embodying the improvement, the wood frame member extending into a metal socket connected to the front post, and the socket having an inner annular shoulder. The several sockets comprised in the frame will embrace the features shown. The end of the frame member, as shown in Fig. 3, has longitudinal kerfs or slits, a conical bore, and an annular channel corresponding with the annular shoulder of the socket. In connecting a frame section to a socket, the end of the frame member is forced beyond the inner annular shoulder of the socket, until such shoulder and the annular channel on the frame member coincide, and a spreader in the form of a tapered screw is inserted in the conical bore in the end of the frame member, the screw being placed in position and turned by a suitable tool. In Fig. 2 the improvement is shown as applied to an angular or square socket, the end of the frame

PINOVER'S BICYCLE FRAME.

section being then correspondingly shaped. In either case, as the screw is forced inward the outer surfaces of the end of the frame section are forced tightly against the inner walls of the socket, making it practically impossible to detach the parts.

THE railway between Jaffa and Jerusalem is in good working order and the trains run between the two places with great regularity. Last year nearly 17,000 tons of freight was transferred between the two places. The railway has resulted in a considerable number of commercial travelers visiting Jerusalem.

PECULIAR BOILER EXPLOSION.

The West Side Street Railway Company, of Elmira, N. Y., sustained a severe loss caused by the explosion of one of their boilers. There were four men in the building at the time of the explosion. The fireman was killed instantly. The engineer was seriously injured, but the other two men escaped with a few bruises.

The buildings were of substantial brick construction. They consisted of a main building, which contained the engine and boiler room, a car house adjoining it on the north and another car house situated fifty feet to the south.

The station was equipped with three Payne & Sons' tubular boilers, each five feet in diameter by sixteen feet long, containing seventy-two four inch tubes. The boilers were numbered one, two, and three in order from the engine room. Each boiler weighed about four tons.

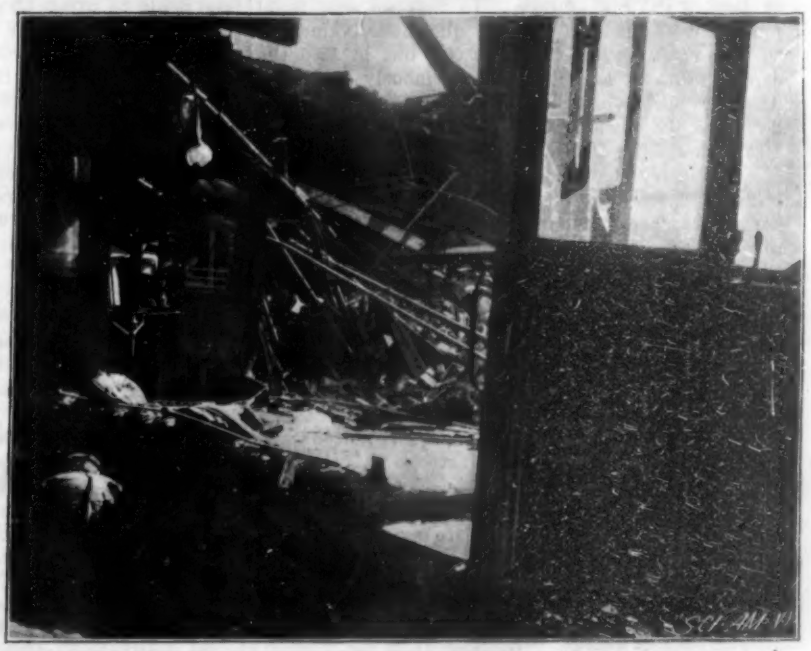
Boiler No. 1, which exploded, was nearest the engine room. It burst in the middle, one end, with the tubes, being blown through two brick walls and two vestibule street cars, and finally landing in a field one hundred feet away. The other end of the boiler was blown to the top of the south wall. The power of the explosion was terrific. Boiler No. 2 was lifted from its foundation, landing on top of boiler No. 3. The roof of the boiler room was completely blown off. Bricks were scattered in all directions for about one hundred feet.

The cause of the explosion is unknown. The boilers had been inspected by the representatives of the Hartford Insurance Company but a few days before, when the tubes were found to be unburned and in perfect condition.

PATH CUT THROUGH BUILDING—PART OF BOILER 180 FEET DISTANT IN FIELD.

ONE-HALF OF BOILER IN FIELD 180 FEET DISTANT.

BOILER EXPLOSION—VIEW LOOKING INTO ENGINE ROOM.



STREET CAR THROUGH WHICH PART OF BOILER PASSED.

ACCORDING to the experiments of MM. Seguy and Quenisset, the X rays cause dangerous palpitations of the heart. The experiments were made on medical students and upon themselves, and MM. Seguy and Quenisset describe the palpitations as violent and unendurable unless the rays were intercepted by a metallic plate.

Comparative Timidity of Boys and Girls.

Boys report 2·21 fears on the average and girls as many as 3·55—a fact which seems to show that they are more timid than boys. There is an increase in the number of fears up to the age of 15 in boys and 18 in girls, but this may be due to the fuller descriptions given by older children and youths. Some of the fears recorded, such as fear of high places, of disease, loss of direction, fear of the end of the world, and of being shut in, are of much psychological interest. President Hall adopts the standpoint that the conscious ego or "I" in a person is but a feeble and inadequate manifestation of the soul, a "flickering taper in a vast factory of machinery and operatives, each doing its work in unobserved silence." Instinct is much older than intelligence, and some of these fears are, in his opinion, inherited from "swimming ancestors," like the gill slits under the skin of our necks. Prof. J. McKeen Cattell, the eminent American psychologist, does not agree with this view; though he admits that children have certain instinctive fears, he thinks that most of them are learned, not inherited, a view which agrees with recent observations on young birds.

Use Color Judiciously.

There are colors that are refreshing and broadening, others that absorb light and give a boxed-up appearance to a room, others that make a room with a bleak northern exposure, or with no exposure at all, appear bright and cheerful; some that make a room appear warm, some that make it cold.

The thermometer seems to fall six degrees when you walk into a blue room. Yellow is an advancing color; therefore a room fitted up in yellow will appear smaller than it is.

On the other hand, blue of a certain shade introduced generously into a room will give an idea of space. Red makes no difference in regard to size. Green makes very little.

If a bright, sunny room gets its light from a space obtruded upon by russet colored or yellow painted houses, or else looks out upon a stretch of green grass, it should be decorated in a color very different from the shade chosen if the light comes from only an unbroken expanse of sky.

Red brings out in a room whatever hint of green lurks in the composition of the other colors employed.

Green needs sunlight to develop the yellow in it and make it seem cheerful.

If olive or red brown be used in conjunction with mahogany furniture, the effect is very different from what it would be if blue were used. Blue would develop the tawny orange lurking in the mahogany.

If a ceiling is to be made higher, leave it light, that it may appear to recede. Deepening the color used on the ceiling would make it lower—an effect desirable if the room is small and the ceiling very high. Various tones of yellow are substitutes for sunlight.—The Upholsterer.

ACCORDING to the British Medical Journal, M. Julien Dumas has announced his intention to interrogate the French government on the abuse of the Bertillon system of measurement. M. Dumas asserts that the calculations made by M. Bertillon are far from correct. He has had in his possession measurements taken of the same person at an interval of ten years. There were not two alike. M. Dumas expressed his desire to visit the anthropometric service. The minister of the interior and the police prefect asked him to name his day. M. Bertillon, with great courtesy, explained his system. He sent for a woman who had refused to give her name. She then said her name was Garcias, her birthplace Bordeaux. Measurements were taken. M. Dumas, being initiated, found without assistance the photograph of this woman, whose real name was Tosas, and her birthplace was not Bordeaux. Much astonished, he warmly praised anthropometry. He carried away with him four or five books on the subject. In one of them he found three photographs typical of the criminals most often met with. One of these was of the woman mensured that morning, kept on the premises, according to M. Dumas, to illustrate the system.

The Increasing Demand for Wood Pulp.

While most branches of business have been languishing, the wood pulp manufacturers have had an unprecedented year of success, and, if the consumption of white paper is any indication of the true literary tendencies of the age, we have reason to congratulate ourselves upon the growth and spread of general education. The fact that our extensive New England forests of spruce have become important agents in spreading the knowledge of letters among all classes is noteworthy in this age, when school children are taught to plant trees each Arbor Day, and it might be a valuable lesson for instruction in the schools to show how dependent we have become upon the trees for the books and periodicals that we buy so cheaply to-day. There has never been a cheaper or better material discovered and utilized for making paper than spruce wood, and the large increase in the number of periodicals in the land is chiefly due to this process of converting forest growths into clean, white, cheap paper.

As a matter of fact, the book and newspaper business can be judged better by counting the number of spruce trees cut down every year than by accepting the circulation figures of wily publishers. The amount of white paper a publishing company consumes is a more trustworthy indicator of circulation than figures sworn to before a notary. If we are to judge the year's output of printed matter in this way, we are safe in saying that the army of general readers is largely on the increase. According to the figures published by the Paper Trade Journal, "the daily capacity of the book and news mills of the United States shows an increase of 14 per cent over last year, and shows the phenomenal increase of 359 per cent during the past fifteen years." As the mills do not produce more than enough to meet the demand, it may be concluded that our literature, such as it is, must be vastly increasing in quantity, if not in quality.

But this increase in the production of white paper cannot be wholly credited to the activity of American presses, for many of the London papers are now printed on the paper made from the spruce trees of New England and Canada. Our export trade in wood pulp and white paper is an infant yet, but it has such a healthy, vigorous appearance that it is safe to predict an important life for it. Great Britain imports annually nearly 300,000 tons of wood pulp for her printing presses, valued at nearly $8,000,000, and the United States are just beginning to realize that our natural resources will enable us to supply a good percentage of the raw material. In 1895 we sent wood pulp to Great Britain in small quantities, valued in the aggregate at less than $250,000, but in 1896 the export trade in this line had enormously increased. American made white paper has been exported to London more liberally than the raw wood pulp.

It is interesting and instructive to note the growth of an industry that dates back only a quarter of a century, especially when that industry becomes such a paramount factor in our civilization that it actually revolutionizes our educational systems. When our Pilgrim Fathers landed in New England they did not look with favor upon the extensive forests of trees, which served as the hiding place for wild animals and equally savage red men, and their one thought was to cut down as many of these giant trees as they could. In the light of the clearings they hoped to find some measure of relief from the attacks and ambuscades of their natural foes. Had their choice been granted them, they would have leveled at one stroke half the oaks, spruces and pines of their new country. It seemed like an endless, hopeless job to hew a space in the primeval forests large enough to accommodate the Pilgrims and their successors.

But of all the trees found in the woods, the spruces appeared to have the least value, and little mention is made of them in early colonial times. The oaks and hickories, and even the tall white pines, were utilized for house building and for making ships with which to carry on the trade of the colonies, and later to fight the mother country with. In time good old white oaks and hackmatacks assumed a value little realized by the first settlers, and lumbermen searched through the great forests for choice specimens of both. Our shipbuilding industry was then rapidly increasing, and it was necessary to secure the strongest and toughest woods for the frames and knees. How well the builders understood their business is testified to in the decaying old hulks of to-day, where the old white oak beams and hackmatack knees have successfully resisted the weather and elements for nearly two centuries.

The hemlock and pine trees grew into general demand and importance when the oak, ash and hickories became relatively scarce, but the spruce trees were passed by as nearly worthless. They were cut down for fire wood, and for some cheap building purposes, but the texture of the wood was considered very unsatisfactory for any important uses. Vast stretches of spruce forests covered the hillsides and valleys of New England, New York and Canada, and in their dense shades lurked the wolves, panthers, bears, and other wild animals. Here and there on the outskirts of the woods a settlement would be established, but no systematic inroads were made into the spruce forests, simply because there was little commercial value attached to the trees.

This is the only reason why to-day we find vast forests of primeval spruces, with trees two and three hundred years old, left undisturbed, and where nature appears in her wildest and most solitary moods. There are regions in New England and Canada covered with dense growths of spruce where probably no human being has ever penetrated. The bear, the fox, the mink, and the panther live here in undisturbed peace. These woods to-day, instead of being apparently worthless, are more valuable than any other forests. Even in the "Pine Tree State," the spruces are worth far more than the pines. Here are millions of dollars' worth of marketable lumber that must in time be converted into white paper.

About thirty years ago the first wood pulp mill was established in the spruce woods of Maine. One of the most important of these pioneer mills was erected in Brunswick, in 1870, by the Androscoggin Pulp Company. The mills were small and unprovided with the modern machinery for chewing and macerating the wood into a pulp, and during the following ten years their growth was slow and far from phenomenal. But in 1880 the value of wood pulp began to be understood, and the industry really dates from that period. The census figures of that year reported in Maine seven pulp mills, with capital invested of $440,000, and an annual product of $300,000, and twelve paper mills, with a capital of $2,000,000 and a product somewhat in excess of that sum. In 1890 the report gave eleven pulp mills, with capital invested $2,695,611, and the value of product, $1,518,611. But to-day there are over $13,000,000 invested in pulp and paper mills in the State of Maine, giving employment directly or indirectly to over 5,000 men.

But Maine has not monopolized the industry, although it was first nursed in its woods. New York State stands first in the production of wood pulp for books and newspapers, having a daily capacity of 1,800,000 pounds, with Wisconsin second with 670,000 pounds; Maine, 665,000 pounds; Massachusetts, 614,000 pounds; Pennsylvania, 403,000 pounds; and New Hampshire, Michigan, Ohio, and Vermont following in order. To supply the mills with raw material it is estimated that 1,000,000,000 feet of spruce logs are required for the white paper used in the publishing business.

In making the best white paper spruce wood has invariably been employed, but in Europe attempts have been made to utilize the pine for this purpose. Both the pine and the poplar are more easily worked into ground pulp than spruce, but the woods lack the strength needed for large newspaper sheets. In Europe the pulp made from pine has proved of value for making the small sheets of books and pamphlets, and even magazines, but in this country, where spruce is abundant, it has received little attention. There is another difficulty in disposing of the pitch and resin in pine, which makes this wood less valuable to the wood pulp manufacturers. In the first experiments in this country poplar seemed to prove the most successful wood, and it was eagerly sought after, but it was soon discovered to be inferior to ordinary spruce. Efforts have repeatedly been made to use the hard woods for pulp, but the paper made from this pulp has the feeling of linen, and is not considered so good as the spruce pulp. Hemlock cannot be used as a substitute for spruce, for the reason that its fiber is more brashy and has less strength than spruce.

Singularly enough, the trees on which the paper manufacturers must chiefly depend for their supply are very slow growing. A spruce tree requires from 100 to 150 years to mature its growth, and the first fifty years of its growth do not yield a very large tree. During the second half century of its existence it develops size rapidly, and the third period is devoted more to the compacting and hardening of the texture. For ordinary paper purposes, the spruce trees that have reached an age varying between 100 and 150 years are just as good as those two and three hundred years old. In the primeval forests of Maine, New York and Canada we have many spruce trees ranging between 200 and 300 years, but many of the growths are in a state of decay. The large trees have made little progress in the last century, and less suitable timber can be obtained from such tracts of forest than from those where the average age is from one to one and a half centuries. The large trees decay as rapidly as the small ones advance, and the forests are consequently at a standstill. While there is danger of the pulp mills denuding the spruce forests too rapidly under the present demand for pulp, it would undoubtedly be a benefit if all the primeval forests could be thinned out without further delay.

The hemlock is rather slow growing, but it is much quicker than spruce, while the poplar is a more rapid growing tree than either. Pine, however, goes ahead of all the evergreen trees in this respect, and sapling pine land will produce a forest fit for box boards, averaging twelve inches in diameter, in thirty to forty years, while spruce would take twice that time for trees of similar size. Even such hard woods as maple, birch and beech grow much faster than spruce or hemlock. For this reason pulp manufacturers have inquired anxiously into the source of their supply, and there is every reason to believe that a vast industry must depend upon the spruce trees for its very existence. Pine, hemlock and the hard woods are out of the question. They can never be made suitable substitutes for spruce for paper making, unless the chemist's art and skill invents some new process of changing their nature. An industry in which millions of dollars are invested will be affected by any reduction in the supply of spruce wood for the next century.

The spruce forests of New England and New York will supply sufficient material for all purposes for many years to come, and Canada and New Brunswick have untold stretches of spruce forests that are scarcely touched as yet; but in spite of all this, farsighted manufacturers are looking into the future and securing for themselves control of forests that will make them independent of any corner in the market of raw material. While the spruce forests are still selling at a small price, they are buying up immense tracts for future use. The woods are thus passing into the hands of capitalists who are able and willing to develop them. Lately an English syndicate attempted to control all the wood pulp manufactories in Canada, and should control of the spruce woods of Lower Canada pass into foreign hands, there would be all the more reason for American mill owners to plant and develop, and not destroy, their New England possessions.

The German pulp manufacturers have demonstrated what can be done with the spruce trees by judicious culture and development. On an area much smaller than that covered with spruce trees in New York State, they have long supplied all the raw material needed for their paper mills, and annually exported over half a million dollars' worth. The forests there are merely thinned out, the old trees being cut down as fast as they reach the proper age, and the results are so highly satisfactory that the mills are assured of a continuous supply of raw material as long as the present system of forestry is continued. A similar intelligent treatment of our spruce forests must be adopted in this country, and there is no doubt but they will receive it now that better equipped owners and managers have secured control of most of the valuable forests.

G. E. W.

Distress in Spain.

The London Financial News says: "The misery which has made itself felt over Spain, and which has given rise in several instances to bread riots, is attested by the railway returns for the opening months of the year. The Norte, for example, up to January 28, showed a shortage in its receipts of 500,000 pesetas compared with the corresponding period of 1896; the Mediodia on the same date was 720,000 pesetas behind the corresponding record for last year, the Andaluces about 60,000 pesetas, the Zafra to Huelva line 55,000 pesetas, while the Bilbao-Portugal division of the Northern, which had receipts of 1,035,000 pesetas for the month of January, 1896, succeeded in showing this January a total of only 902,000 pesetas. As the outlook for the agricultural and commercial industries of the country for the coming season is far from hopeful, and the straits of the government for money must soon be extreme, the Spanish railways will in all likelihood reflect a dismal state of things at the end of the year. The fall of about 27 per cent in the value of the peseta is an additional burden which the companies have unfortunately to bear, and no alleviation of it is possible until peace and sound business conditions are restored. This is a consummation which the French holders of Spanish railway securities must be very anxious to see hastened; but neither the silver-coining policy of the Finance Minister nor the dilatory policy of the Cabinet in applying reforms, nor, still further, the renewed Carlist movement, give any assurance of it as yet."

Size of a Spider's Thread.

Leeuwenhoek, the first microscopist, wrote in 1685 as follows: "I have often compared the size of the thread spun by full grown spiders with a hair of my beard. I placed the thickest part of the hair before the microscope, and, from the most accurate judgment I could form, more than a hundred of such threads placed side by side could not equal the diameter of one such hair. If, then, we suppose such a hair to be of a round form, it follows that 10,000 threads spun by the full grown spider when taken together will not be equal in substance to the size of a single hair. To this, if we add that 400 young spiders, at the time when they begin to spin their webs, are not larger than one full grown one, and that each of these minute spiders possesses the same organs as the larger ones, it follows that the exceeding small threads spun by these little creatures must be still 400 times slenderer; and, consequently, that 4,000,000 of these minute spiders' threads cannot equal in substance the size of a single hair."—Microscope.

STEAM DUMPING SCOW FOR THE STREET CLEANING DEPARTMENT OF NEW YORK.

(Continued from first page).

tem, the refuse from the streets and from the houses and hotels is no longer collected indiscriminately; but the householders are required to place the ashes and the garbage in separate bins. For the past few months, moreover, a third class of rubbish has been established. This is known as "light refuse," and comprises rags, paper, carpet, sacking, etc.

The refuse is carted separately, according to its nature—ashes, garbage or light refuse—to the "dumps" on the river. Here the ashes are unloaded into scows and taken down the harbor and well out to sea, where they are dumped to the eastward and southward of Sandy Hook, or at a point about thirty miles distant from the New York docks. In former years it was customary to dump the whole of the city refuse, ashes, garbage and general rubbish outside Sandy Hook, and one result of this practice was that the lighter material was regularly washed up upon the shores of Long Island and New Jersey, which were freely strewn with a fringe of decaying and exceedingly unsanitary and unsightly matter. At present it is only the ashes that are carried to sea, and as the government authorities are of the opinion that the unloading of so many thousands of tons of material assists in shoaling up the entrance to the harbor, the practice is shortly to be discontinued.

The plan of separating the ashes and durable refuse from the garbage enables the city to utilize the former material for reclaiming waste land and for general filling purposes; and plans are now being carried out for using it in reclaiming portions of Riker's Island, which lies off Port Morris, on Long Island Sound. When the receiving basins on the island are completed, the ashes will be unloaded into large steam dumping boats, of the type which is shown in the front page engravings, and these will carry it to the island and dump it over the suction pipes of a large vacuum pumping plant. The garbage is taken to Barren Island and there disposed of, and after the salable material has been taken out of the light refuse, the residue is burnt up in a destructor furnace.

The first of the three self-propelling dumping boats which were ordered is now at work carrying ashes to the outside dumping ground. It has been built from the designs of Lieut.-Commander Delahanty by the Nixon Shipbuilding Company, of Elizabethport, N. J.

The Cinderella, as the boat is named, is constructed of open hearth steel. The body is built in two separate sections somewhat on the catamaran principle. Each hull is 136 feet long and is of a general oval cross section, measuring 8 feet in width by 10 feet in depth. Between the hulls is a long, deep, rectangular box, the walls of which extend 8 feet above the deck, the depth from the top of the walls to the hinged floor being 13 feet. Each hull, or pontoon, is divided into eight watertight compartments by means of plate bulkheads, and the square dumping box is divided by plate partitions into six separate pockets. The bulkheads and the plate partitions are in the same plane, so that the ship is braced from side to side by six continuous walls of plating, and is proportionately stiff and unsinkable. The frames consist of 2½ inch by 2½ inch by ⅞ inch angles, spaced 3 feet apart, closer spacing being used in the neighborhood of the pockets, and the hulls are further stiffened by 3 inch by 3 inch by 7 pound angles which extend from side to side at every 9 feet and are tied to the frames with gussets of 10 pound plate 18 inches deep. Each compartment of the pontoons is devoted to a separate purpose. In one is the tank, in another the galley, and others are devoted in their order to boilers, coal, and engines, and cabins for the crew. Astern of the dumping pockets is a commodious pilot house and cabin, which are located at a sufficient height to give a good outlook for navigation purposes. The narrow boxlike structures which will be noticed built upon the deck of the pontoon are companionways which lead from the upper platform deck to the various compartments before mentioned.

The side walls of the central dumping space are built of 10 pound plating, stiffened at intervals with a pair of 3 inch by 3 inch by 7 pound angles. The partition walls are built of 12 pound plating stiffened with 14 pound angles. There are six pockets for the refuse, and the floor of each pocket is formed of a pair of vertically swinging doors which are hinged to the walls of the pontoons and are drawn up and held in a horizontal position by means of chains which are attached to the outer edges of the doors and pass up over drums which are located on the platform deck. The work of releasing and closing the doors is performed by a ten horse power engine in the engine room. This drives, by means of a vertical shaft and bevel gearing, a long horizontal shaft which is placed upon the platform deck against the wall of the pockets. Opposite each pocket there is a drum and a set of multiplying gears which are thrown into engagement by means of coned bearings and friction clutches. When the doors have been drawn up they are held in place by means of a compressor block which is operated by a large handwheel. The arrangement of the platform deck and the lifting gear is clearly shown in the engraving on the front page.

The pockets can carry about 600 cubic yards of ashes and street sweepings, the weight of which will average about 300 tons.

The ship is driven by two separate engines of 125 horse power, one in each hull, each of which operates its own propeller. Steam is supplied by two Roberts boilers. There are two rudders, one for each hull, and they are steered by a single wheel in the pilot house. The speed with a full load in the pockets is about ten knots an hour.

The South American Cowboy.

BY GEORGE ETHELBERT WALSH.

The gaucho, or South American cowboy, is in many respects a duplicate of the rapidly disappearing cowboy of our Western plains, differing only from him in habits and customs that climate and surroundings are responsible for, and possessing many good qualities that are scarcely noticeable to casual strangers who happen to meet him for a few hours at the stations and small towns. At such times he is usually drunk, unamiable, slouchy, and unattractive. He is out of his element, and a judgment based upon such observations is unjust. In his home on the plains his picturesque appearance and his really fine accomplishments are set off to better advantages.

The cowboy, the shepherd, and the plainsman are all classed as gauchos, but the first is more typical of what the word means. His life is spent on horseback, riding over the endless stretches of plains, corraling his cattle and branding them, and occasionally hunting the wild panthers, ostriches, or guanacos. His saddle is the most uncomfortable seat in the world, but he strides it with the ease and grace of an Indian. The wild mustangs of the gauchos are fully as ungovernable as any on our Western plains, and they shy right and left, rear on their hind legs, and even roll on the ground to shake their riders. But once in his saddle, the cowboy is not to be dislodged by any trick of man or beast. He will remain in the saddle from the break of day to the going down of the sun, stopping only long enough to eat and drink.

The diet of the gaucho is not noted for its variety, but of its kind it is good. The morning meal is characteristic of the Spanish-American people—a cup of maté, the tea herb of Paraguay, and a fair substitute for coffee, a piece of cold meat, and a pipe of tobacco. With this slim repast over, the cowboy is ready for a ride of several hours in the keen morning air. The midday meal is not much more elegant, either in variety or quantity; but when night comes he is ravenously hungry, and a course dinner will be prepared. This consists of some good fresh meat—the flesh of a panther, rabbit, partridge, or steer—a cup of the inevitable maté, the wild berries of the plains, and possibly an ostrich egg. In the course of the day the gaucho is very apt to startle up a mother ostrich from its nest, and after killing the bird he will return and look for the nest.

One egg holds enough meat to make a big omelet, and when properly cooked it has a peculiar and delicious flavor. One end of the shell is broken, and then the egg is placed on the hot coals to cook. In a few minutes the egg is ready for eating, and the cowboy digs out the meat with his knife and gulps it down greedily. The mother ostrich is meanwhile skinned, and the feathers are carefully preserved until some time when the gaucho goes to some settlement. There he receives fifty cents a pound for them, which enables him to buy a few trinkets for his squaw wife and a good stock of rum.

The Western cowboy is said to be helpless without his revolver, but this does not apply to the South American gaucho. He rarely if ever has such an instrument, and not even a rifle is carried with him. His indispensable weapons are the lasso, of horse hair rope, the bolas and the knife. The latter is his weapon of defense when fighting with human enemies, and the first two are his weapons for offense when chasing the wild horses, steers, guanacos, ostriches, panthers, and even birds. With his knife he can perform wonders, using it for all emergencies at close quarters, from slitting the throat of an animal to the carving up of another human being. A man who should use a revolver in a fight with a South American cowboy would be despised and would very probably be strung up for his cowardly actions. The revolver has no place in their wild, nomadic life.

The bolas is really the weapon that is unique and peculiar to these South American cowboys, and through long years of constant practice, it is really a deadly instrument. It consists of two or three small iron balls, one and a half inches in diameter, attached to pieces of stout cord three feet long. The other ends of these cords are gathered together in a big knot, which gives the cowboy a firm purchase. The accomplishments of the gaucho with this instrument are little short of the marvelous. He swings it over his head once or twice to give it force, and then, with a twist of his wrist, hurls it with unerring aim at the object. Within a range of thirty to sixty yards the man can bring down any small game, and even at eighty to one hundred yards he has been known to hit panthers and rabbits. The two or three balls swing wide apart in their flight, and thus there is a range of six feet in which to hit the target. At short range the cowboy hits the game with the iron balls, stunning or killing them with the blow, and in this way he will bring down partridges and rabbits by dashing in their midst and striking just as they jump to run.

On the plains the cowboys practice daily with their bolas, using them to bring down cattle, a stray ostrich, a rabbit, or a guanaco. When the cattle are rounded up to be branded the lasso is used, for the bolas is more apt to break bones than anything else, and consequently they are useless for this work. But after the cattle have been branded an exhibition of throwing the bolas may be given to create a little excitement. The lasso is thrown with the same skill as the bolas, and it never fails to settle over the head of the steer selected.

Their work of branding cattle is naturally cruel and blunting to fine sensibilities. It is necessary by law for every herder to brand his cattle if he wishes to claim them, and the cowboys are not particular as to the niceties of the civilized code of honor about torturing animals. The cattle are rounded up on the plains, and those selected for the branding are thrown violently upon the soft earth, and then either a hot iron or a sharp knife inflicts a more or less serious skin wound in the shape of a cross, circle, or whatever geometric figure may strike the fancy of the owner.

The South American cowboy is never made of the stuff that converts a man into a cattle king worth his millions, and the rare good fortunes that have been made on our Western plains by enterprising cowboys are never repeated in the southern hemisphere. The ambition of the gaucho never rises to such flights of fancy. He is content to live his life to the end on the boundless plains, riding in the saddle for a living, and associating with the same people and scenes until death intervenes. He has nothing of the Yankee ingenuity and mind for scheming, and he would not know what to do with his money if he gathered a few thousands of dollars together. Probably a good part of it would be put into rum and the balance into more stock.

Stretched at regular intervals on the pampas plains are mud walled huts called "homes." In many respects they resemble the adobe huts of the Southwest of our own country. They are made of blocks of sun dried mud, with the roof composed of dried grass, mud and a few willow rafters. Wood is scarce on the pampas, just as it is on the plains of the Southwest, and the cowboys make the most of every dead trunk that can be found along the courses of the rivers. These are always carefully preserved for roof rafters, and every gaucho attaches more value to these than to anything else that goes to form his house. The mud and grass are so plentiful that there is no market price attached to them. Labor alone is the commodity that has value in such house building.

The roofs of these mud homes frequently leak, and the owners attempt to patch them up with mud and grass until the thickness is nearly two feet. The mud house usually consists of one large room, but occasionally two or three adjoining bedrooms are added. The beds are made of pampas grass and the skins of the panther and cattle. Chairs and tables are scarce, but occasionally a few old stools and a dry goods box will be found in the huts. In this rude home the cowboy spends part of his time when he is not in his saddle, and his squaw wife and children live there most of the time watching and waiting for their lord and master to come home.

A more attractive place than this home are the gaucho saloons, which are scattered pretty plentifully across the pampas. This place is built of mud, but it is usually larger and more attractive than the ordinary home of the gaucho. Coarse pictures conceal the barrenness of the walls, and, to the cowboy's way of thinking, vastly improve appearances. There are cheap lithographs of actresses, fighting scenes, and obscene pictures gathered from the four corners of the earth. Rum and beer are dispensed at these saloons in quantities, and the gauchos assemble there to have a regular spree, nearly always ending up with a free fight. The deaths that occur at the gaucho saloons are many, but they are usually hushed up and nobody is the wiser. The scenes enacted there seem to be the necessary and fitting climax to the wild, rough life the gauchos lead upon the pampas, and, according to their code of honor, it is no disgrace to end an existence in such a tragic way.

SHIPS propelled by gas engines are apparently gaining favor in France. A new boat of this type has recently been put in service for the Havre-Rouen-Paris line, the speed attained being 7 knots. It is 100 ft. long, with 7 ft. draught, divided into four watertight compartments. The gas is supplied from on shore, and is stored on board in a steel holder, an accumulator composed of steel pipes, under a pressure of 95 atmospheres, about 850 lb. The engine employed is a two cylinder one, of 40 horse power.

THREE IMPROVED TYPES OF THE MAXIM AUTOMATIC RAPID FIRE GUN.

The development of automatic devices in the smaller classes of rapid fire and machine guns has given them an enormous superiority over such guns of the common type, the Maxim 1½ inch automatic machine gun, for instance, firing 300 one pound shots per minute, with a velocity of 1,800 feet per second.

The development of the rapid fire and the machine gun has been marked by the display of great inventive skill, and those machine guns in which the gun is rendered absolutely automatic show the very refinement of ingenuity. As many of our readers are aware, rapid fire guns in general may be divided into three classes according as they are operated entirely by hand or are partly automatic and partly hand-operated or are entirely automatic. In the last case the cartridge is extracted, the new cartridge inserted, the barrel returned to firing position and the gun fired at the continuous rate of ten shots a second without any interference by the operator, the motive power being the energy of the recoil.

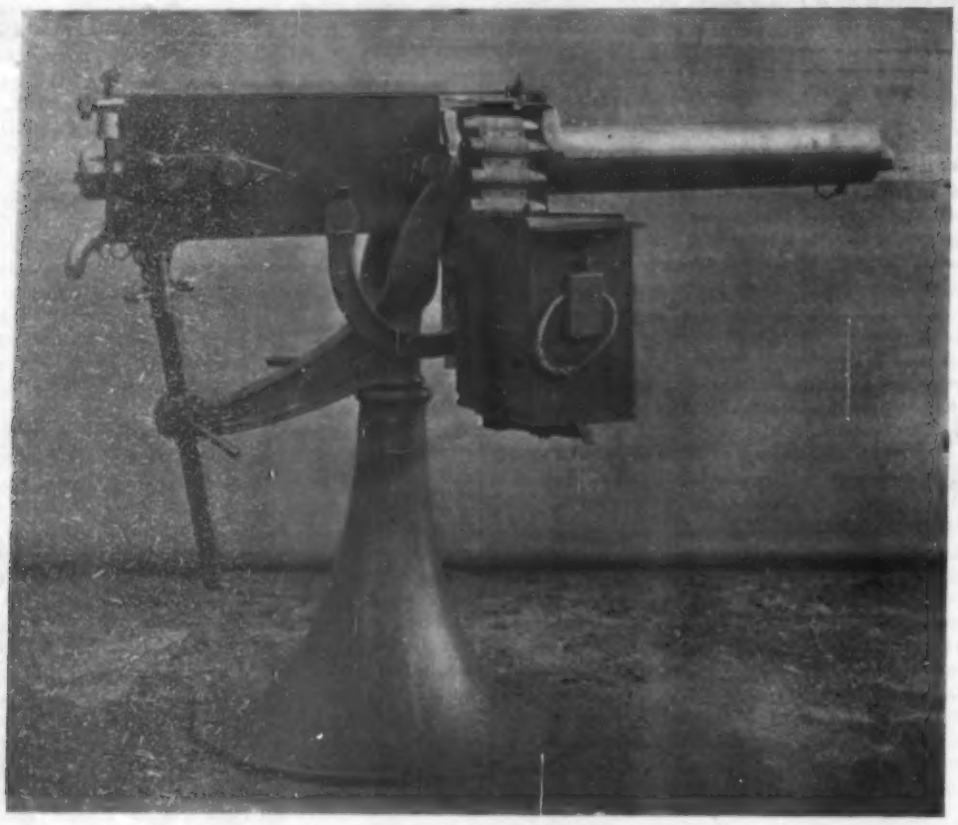


Fig. 1.—MAXIM 1½ INCH AUTOMATIC MACHINE GUN ON NAVAL MOUNTING.
Fires 300 one pound shells per minute. Velocity of shells, 1,800 feet per second; penetration, 2¼ inches of iron.

Our illustration, Fig. 1, shows the Maxim 1¼ inch automatic machine gun on a naval cone mounting. The gun proper consists of two parts, namely, the recoiling and the non-recoiling. The recoiling portion is the barrel, the muzzle of which can be seen in the illustration projecting through the front cover of the water jacket, the recoil plates, the lock and the crank handle, which can be seen in the illustration on the nearer side of the gun. The non-recoiling part of the gun consists of the circular water jacket inclosing the barrel, the casing or frame containing the recoil mechanism, the rear cover of the machine and the trigger and pistol grip and a socket carrying the rear sight.

The water jacket is fitted with three openings, one for receiving the water, another for drawing it off and the third for letting out the steam, the third opening being connected to a system of tubes which permit the steam to escape but not the water in whatever position the gun may be laid.

The gun is supplied with cartridges from a belt which is carried in a box to the right hand of the gun and passes through a feed block on the top of the gun from right to left. The feed block carries two movable pawls and two stationary ones. The movable pawls are attached to a slide in the upper part of the feed block, which moves from left to right by means of levers acted upon by the barrel, the recoil of the barrel causing the motion. The pawls are pressed down by a spring and, engaging behind the next cartridge in the belt, move it forward automatically. When the barrel returns, the pawls place the cartridge still in the belt immediately over the chamber. When a shot is fired, the barrel, with the recoil plates to the rear of it, recoils for about an inch and a half, and the strong spiral spring surrounding the barrel is brought into a state of compression. During the recoil the crank handle, which is seen on the right hand side of the gun case, moves upon a small roller, which is placed beneath it, and the curve of the crank handle causes it to rise and throw the mechanism sufficiently far back clear of the breech to extract the empty case (of the previous round) from the barrel and draw a fresh cartridge from the belt. The turning of the crank above mentioned throws a volute spring attached to the crank shaft into tension. As the lock travels backward, the carrier drops down and the new cartridge, which the carrier has taken from the belt, is brought opposite the chamber at the barrel and at the same time the empty case is brought opposite the ejecting tube. The spiral spring above mentioned, which surrounds the barrel, now returns the barrel and the recoil plates into the firing position, and, as the lock moves forward, it pushes the new cartridge into the chamber and the empty case into the ejecting tube. The gun is now loaded and is ready to commence firing, which it will do as soon as the trigger is pulled. It will continue firing at the rate of five shots a second as long as pressure is maintained on the trigger and cartridges remain in the belt. The destructive power of such a weapon in the hands of a cool and skillful gunner would be terrible to contemplate.

This gun is well adapted to all kinds of service where rapid, continuous and accurate fire would be valuable. The various parts of the mechanism are strong and reliable, and, owing to the automatic character of the firing, great accuracy is possible. The lightness and compactness of the gun render it well adapted for use on torpedo boats, and it would also prove very effective for defense against torpedo boat attack.

Of course the mountings of the gun vary according to the different services for which it is intended to be used. The T piece, as will be seen in the illustration, works in a socket in the mounting, and the gun is capable of free motion in a horizontal plane, though, if it is desired, it can be clamped in any particular position. The position of the gun in a vertical plane is determined by means of an elevating screw which works in the end of a suitable arm attached to the T piece above mentioned. The training is effected by the man who lays the gun, who with his left shoulder pressed against a shoulder piece, and his right hand on the pistol grip, has full control over the movements of the gun. The particulars of this gun are as follows:

Caliber	1·45 inches.
Length of gun over all	73·75 "
Rifling, uniform 12 grooves	1 turn in 30 calibers.
Weight of shell	1 pound.
Length of common shell	3·67 inches.
Weight of powder charge (smokeless)	1 ounce 110 grains.
Velocity at muzzle	1,800 foot seconds.
Perforation of wrought iron at muzzle	2·25 inches.

The fully automatic principle has been applied by Mr. Maxim very successfully to guns of larger caliber. Fig. 2 represents a nine pounder naval gun which is provided with a hopper feed and is capable of firing sixty rounds per minute. This gun and all of its class are worked by the recoil of the barrel. When the arm is loaded and the breech closed, the trigger is pulled and the barrel recoils, taking with it the breech block, the energy of the recoil being checked by a hydraulic buffer, and the barrel returns into the firing position by the action of a powerful spring. The breech remains closed during the recoil and also during the forward movement of the barrel, and it is not opened until the barrel has nearly reached the firing position. By this means the breech remains closed long enough to allow the gases to escape. The cartridges, which in this case are three feet long, are placed in a magazine on the top of the barrel, and at each discharge the lowermost cartridge is thrown into a tubular carrier. The tubular carrier falls by the weight of the cartridge, and when opposite the barrel springs rapidly forward, throwing the cartridge into the chamber and liberating the breech block. The carrier, being now relieved of the weight of the cartridge, rises again into position opposite the lowermost cartridge in the magazine. At each discharge the carrier is thrown back against the action of the powerful spring. It might be said that the carrier is in a cocked position after each discharge and remains so until the cartridge falls down into line with the barrel, when it is liberated and the spring projects the cartridge into the chamber with great force. This arm is particularly well adapted for defense against torpedo boats, as it gives the gunner an opportunity of delivering a considerable number of shots in rapid succession without any assistance. Moreover, when the gun becomes heated, it is not necessary that the cartridge shall remain in the chamber while the gunner is watching for a torpedo boat. The cartridge being in the carrier, it is only necessary to allow it to fall in position, when the gun is instantly loaded and may be fired inside of a second.

The two guns already mentioned are shown upon naval mounts for use on shipboard; but the same types are also furnished with gun carriages for use in field service.

Another very interesting gun built by the same company is the hand-worked field gun shown in Fig. 3.

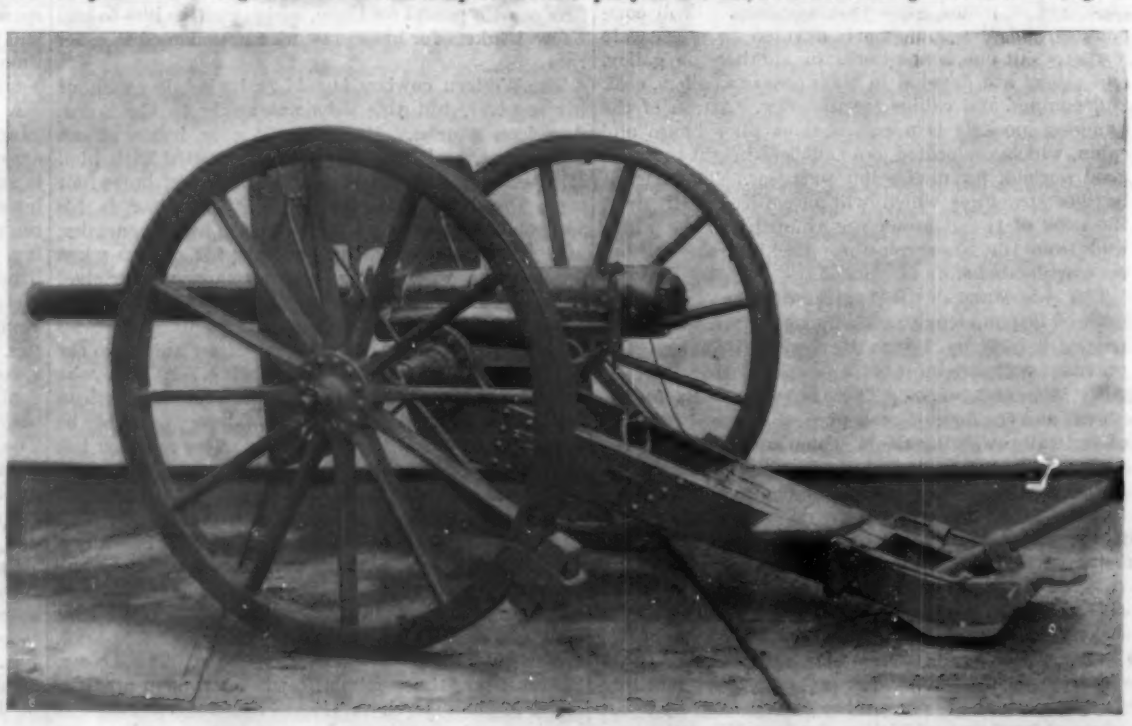


Fig. 3.—MAXIM HAND-WORKED FIELD GUN.
Weight of shell, 12 pounds. Rapidity of fire, 20 rounds per minute.

The caliber of this gun is three inches and the weight of the shot twelve pounds, and they may be fired with a rapidity of twenty rounds per minute. Field guns as ordinarily constructed have an excessive recoil, which is so great that the gun has to be brought up to position after each discharge. The Maxim-Nordenfelt Company has overcome this difficulty by allowing the barrel to recoil through a considerable distance on the carriage itself, the recoil being checked by a hydraulic buffer, the result of which is the carriage remains in approximately the same position and the gun requires only a very slight adjustment after each discharge.

The same company also makes semi-automatic guns, that is, guns in which the recoil of the barrel opens the breech and extracts the empty case, the breech remaining open until a new cartridge is thrust in by hand. The act of pushing in the cartridge disengages the breech block, which then closes itself with a spring. We are informed by Mr. Maxim that he has himself, without any assistance, fired forty rounds in fifty seconds from a gun of this type. The projectiles in this case weighed three pounds each, the cartridges being twenty-one inches long.

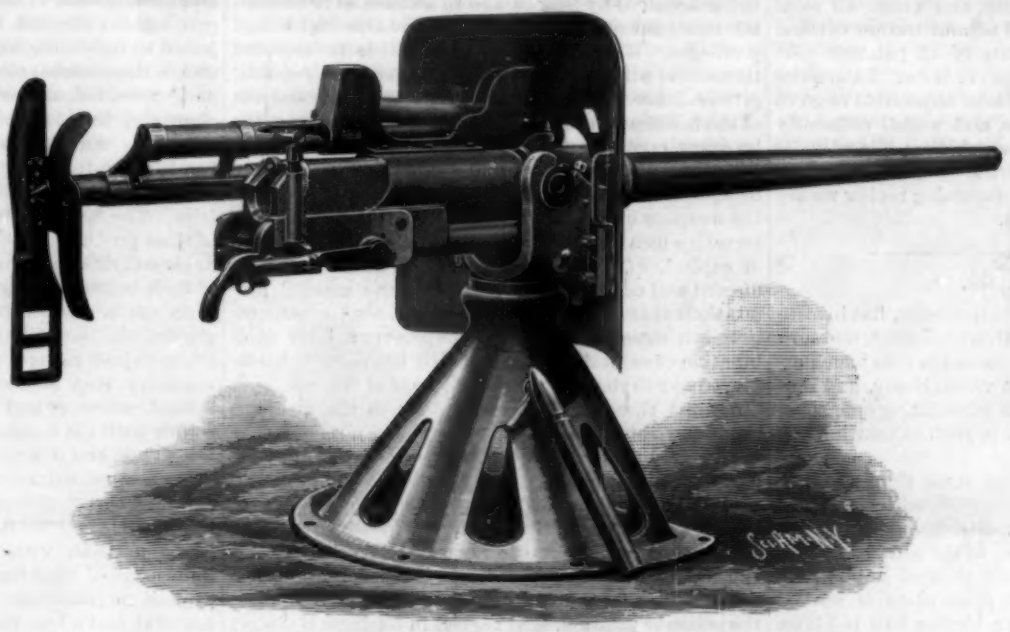


Fig. 2.—FULLY AUTOMATIC MAXIM NAVAL GUN.

Weight of shell, 9 pounds. Rapidity of fire, 60 rounds per minute.

MISS KINGSLEY'S TRAVELS IN AFRICA.

Although needing no such adventitious aid to popular notice as the recent massacre in Benin, the publication of Miss Kingsley's book is peculiarly appropriate just now, dealing as it does with that long stretch of maritime country from Sierra Leone to the Cameroons, including the districts known as the Ivory, Gold, and Slave Coasts. Although comprising some of the oldest colonized portions of Africa, comparatively little is known of these regions, and Miss Kingsley's volume, "Travels in West Africa, Congo Francais, Corisco, and Cameroons," by Mary H. Kingsley (London: Macmillan & Company, Limited), will be welcomed not only by ethnographers and students, but by all who take an interest in queer peoples and strange lands. For it is a wonderful book, written by a remarkable woman. Had it been written by a man, it would have been a monumental performance. But when it is remembered (however difficult it sometimes is to do so) that this is the record of a woman's travels and work, it makes one proud of one's race, and renders it easy to understand why and how the British make the best colonists. That a woman should go alone and unarmed (for Miss Kingsley, unlike some other African explorers, never fired a shot at a native) into these savage and dangerous countries; should brave the terrors of disease, swamps, wild animals, and cruel and bloody customs, just for the sake of making collections of rare fishes and investigating the curious "fetish" customs of the inhabitants, is a marvel indeed. True, Miss Kingsley herself does not appear to think her conduct and adventures very extraordinary. She minimizes the dangers, and makes light of the difficulties and miseries of traveling in this "Land of the Shadow of Death." Intelligently, appreciatively, often enthusiastically, does she speak of the Guineas and their inhabitants, and especially so of her pet tribe, the Fans.

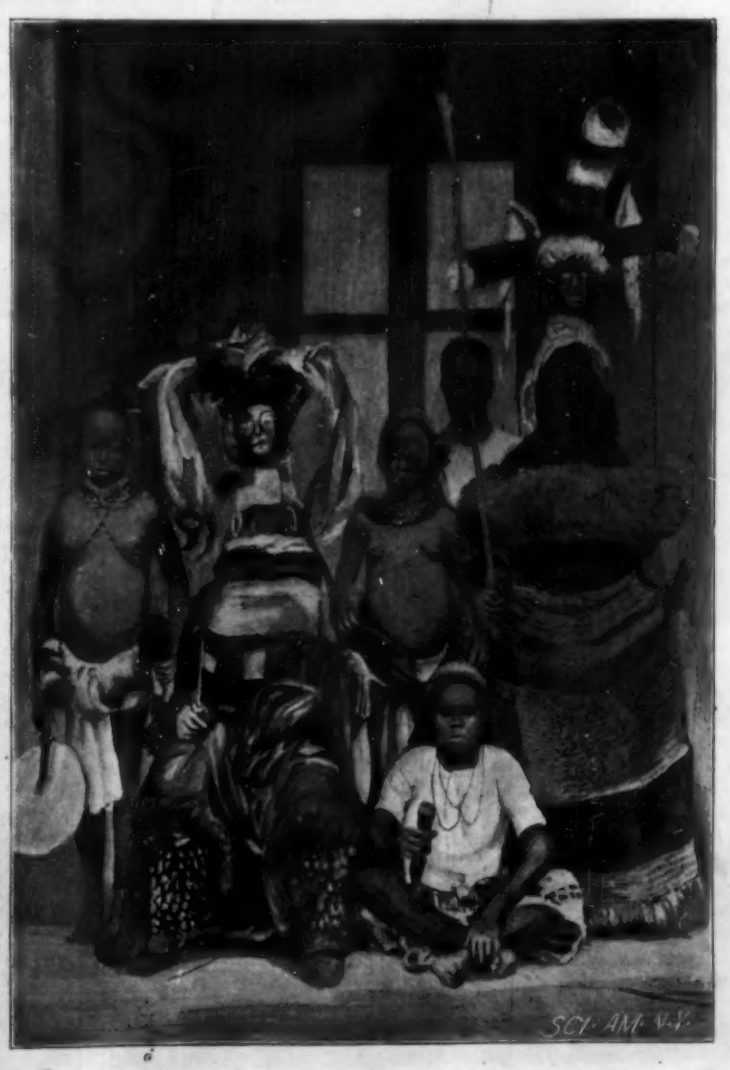
It was on December 23, 1894, that Miss Kingsley left Liverpool for Sierra Leone. Early in the January following she landed at Free Town, concerning which port she gives us some amusing details. Cape Coast Castle and Akkra were the next places of interest at which the author stopped.

Miss Kingsley's chief motive for going to West Africa was to study the African form of thought among a tribe in its original state. It is not surprising, therefore, that she devotes five long and interesting chapters to Fetish, which embraces not only the negro's religious and mental life, but exerts a paramount influence on, and is commingled with, his everyday life, down to his simplest action. About this she says:

"Since 1893 I have been collecting information in its native state regarding Fetish, and I use the usual terms fetish and ju-ju because they have among us a certain fixed value—a conventional value, but a useful one. Neither 'fetish' nor 'ju-ju' are native words. Fetish comes from the word the old Portuguese explorers used to designate the objects they thought the natives worshiped, and in which they were wise enough to recognize a certain similarity to their own little images and relics of saints, 'Feitiço.' Ju-ju, on the other hand, is French, and comes from the word for a toy or doll; so it is not so applicable as the Portuguese name, for the native image is not a doll or toy, and has far more affinity to the image of a saint, inasmuch as it is not venerated for itself, or treasured because of its prettiness, but only because it is the residence or the occasional haunt of a spirit."

Although crude in essence and cruel in application, the negro's Ju-ju, or religious belief and practice, has still many common sense reasons underlying it, and occasionally a poetic idea entwined with a lot of arrant nonsense.

The Ju-ju man frequently combines, as he generally does in all savage races, the offices of priest and medicine man. Whatever he may be as a priest, as a doctor he is mostly a failure.



DEATH DANCE COSTUMES, OLD CALABAR.

"The African doctor is not always a witch doctor in the bargain, but he is usually. Lady doctors abound. They are a bit dangerous in pharmacy, but they do not often venture on surgery. So, on the whole, they are safer, for African surgery is heroic. Dr. Nassau cited the worst case of it I know of. A man had been accidentally shot in the chest by another man with a gun on the Ogowé. The native doctor who was called in made a perpendicular incision into the man's chest extending down to the last rib; he then cut diagonally across and actually lifted the wall of the chest, and groped about among the vitals for the bullet, which he successfully extracted. Patient died."

One of the chief reasons for killing wives, slaves, and other persons on the occasion of a great man's death among West Africans is not because they delight in shedding blood, but that the chief may have servants and wealth and position in the next world. In the Niger Delta there is a different reason, but one equally efficacious in the destruction of human life.

"Among the Tschwi the slaves and women killed are to form for the dead a retinue and riches wherewith to start life in Srahmandazi, where there are markets and towns and all things as on this earth, and so the Tschwi would have little difficulty in replacing human beings at funerals with gold dust, cloth, and other forms of riches, and this is already done in districts under white influence. But in the Delta there is no under-world to live in, the souls shortly after reaching the under-world being forwarded back to this in new babies, and the wealth that is sent down with a man serves as an indication as to what class of baby the soul is to be repacked and sent up in. As wealth in the Delta consists of women and slaves, I do not believe that the under-world gods of the Niger would understand the status of a chief who arrived before them, let us say, with ten puncheons of palm oil and 400 yards of crimson figured velvet. They would say, 'Oh! very good as far as it goes, but where is your real estate? The chances are you are only a trade slave boy and have stolen these things.' And in consequence of this, killing at funerals will be a custom exceedingly difficult to stamp out in these regions."

The tribe of West Africans most favored by Miss Kingsley were the Fans, as they have more of the qualities she likes than any other tribe she has met.

"They are brave, and so you can respect them, which is an essential element in a friendly feeling. They are on the whole a fine race, particularly those in the mountain districts of the Sierra del Cristal, where one continually sees magnificent specimens of human beings, both male and female. Their color is light bronze, many of the men have beards, and albinoes are rare among them. The average height in the mountain districts is five feet six to five feet eight, the difference in stature between men and women not being great. Their countenances are very bright and expressive, and if once you have been among them, you can never mistake a Fan. But it is in their mental characteristics that their difference from the lethargic, dying-out coast tribes is most marked. The Fan is full of fire, temper, intelligence and go; very teachable, rather difficult to manage, quick to take offense, and utterly indifferent to human life. I ought to say that other people, who should know him better than I, say he is a treacherous, thievish, murderous cannibal. I never found him treacherous, but then I never trusted him."

Added as appendices are some remarkably able essays on such important questions as trade and labor and disease in West Africa. With the former the missionary question is indissolubly associated, for the missionaries seek to place impediments in the way of the liquor traffic—by means of which most of the trade is done, especially in the interior, where commercial transactions are all conducted by barter, and bottles of spirits are the handiest and safest medium of exchange. The author's travels in French

and German territory — of the officials of which countries she speaks very highly — possess a strong interest both for geographer and statesman. Like the true patriot she is, Miss Kingsley not only sees the possibilities of the usefulness of these West African colonies to Great Britain, but is desirous that they should be utilized to their fullest extent. Since the force of circumstances, duty, and profit all seem to tend to our occupation and administration of these extensive districts, it is the duty of all patriotic persons to know as much as they can of them. To acquire this knowledge it would be almost impossible to go to a more instructive, informative, and withal eminently enjoyable work than that in which Miss Kingsley describes her travels in West Africa.

For our engraving and the foregoing review we are indebted to St. James's Budget.

Science Notes.

Professor Von Voit, of Munich, Germany, has investigated the nutritive value of extracts of meat, and now announces as the result of his researches that such extracts have very little nutritive value, if any, and that their action is almost entirely a stimulating one, being due to their contents of alkaloids, such as creatine and creatinine.—Prometheus.

A very interesting account of some simple experiments on central attraction is contributed by Mr. R.W. Wood to the Physical Review. Mr. Wood employs a circular glass plate having a hole in the center through which the "somewhat conical" pole of a powerful electro-magnet projects. This glass plate is worked and set quite level, and then a bicycle ball is blown across it in the direction of—but not exactly to—the pole of the magnet. Parabolas, hyperbolas, and ellipses can thus be described on the plate by giving varying initial velocity to the ball.

The great objective of the Yerkes telescope at the Yerkes Observatory, Williams Bay, Wis., has been successfully placed in position, and on May 21, President Harper, of the Chicago University, and a party of representative Chicagoans were present. The visitors were shown the two motions of the telescope, the clock was started, the lifting floor came up with a motion almost imperceptible, the great dome revolved, and the telescope was turned on Jupiter. Director Hale then adjusted the instrument and President Harper was the first of the visitors to look through the greatest telescope in the world. Professor Barnard declares that it is not possible to estimate what the telescope may do for science. It may take several weeks, and possibly months, for the operators to successfully solve the problems which the atmosphere may present.

The property acquired by gases, after being traversed by electric sparks, of cooling heated bodies as if the gases had become better conductors of heat, forms the subject of a short note by Prof. E. Villari (Rendiconti della R. Accademia di Napoli), says Nature. The phenomenon was observed by studying the action of different gases on a platinum spiral heated to redness by the electric current, the sparks being produced by a powerful coil reinforced by large Leyden jars. In some cases the apparent cooling produced a fall of resistance of 10 per cent. Under similar conditions, the effect was nearly the same for oxygen, nitrogen, and air, but was much less marked in the case of hydrogen. It increases with the energy of the sparks, and also, at first, with the temperature of the spiral; but after this exceeds a certain limit, the refrigerating power decreases. Experiments made with a similar apparatus, with a view of testing whether Roentgen rays modify the thermal conductivity of the gases they traverse, have as yet given negative results.

Those who have studied rocks from the point of view of their magnetic properties, observes a writer in Nature, have long been aware of the existence of certain isolated portions, or zones, endowed with intense magnetization, the distribution of which, in general, bears no fixed relation to the direction of the earth's magnetic field. The theory has been frequently advanced that these singular points owe their magnetization to discharges of lightning, and this theory is said to have received a remarkable confirmation at the hands of Dr. G. Folgheraiter, who finds, as the result of numerous observations of the remains of walls and ancient buildings in the Roman Campagna, that these structures frequently exhibit singular points and zones in every respect identical with those observed in rocks. It is suggested that the presence of singular points in walls might be accounted for by supposing that they had existed in the stone before it was used for building; but this explanation is incapable of accounting for the singular zones in which a number of adjacent stones, as well as the mortar connecting them, were found to be so powerfully magnetized that even a small detached portion of the mortar was capable of deflecting a compass needle through 180°. These zones could only have derived their magnetization after the wall had been built, and the presence, in some cases, of cracks down the wall in the neighborhood of the singularities, such as would be caused by lightning, tends to confirm the present theory of their origin.

The Truth and the Trusts.

Perhaps the most discussed subject in this republic to-day is the question of capitalistic combination for carrying on business operations. The agitators, taking advantage of the general interest in this question, have been quick to take up the cry that the liberties of our people, the resources of our land and the land itself, are being acquired by the few and so utilized as to defraud the many out of their just and inalienable rights and privileges. Without taking the trouble to acquaint themselves with the truth, many citizens of the republic give credence to the assertions of the agitators, and out of the falsifications by malicious propagandists and the ignorant credulity of their followers have arisen confusion, perplexity, discord and conflict. The only way to fight erroneous public opinion is to meet it with the weapons of fact and figure, and this is what conservative men are doing. The propagandists of hatred of capital, of hostility to wealth in general, and of discord and conflict have laid down the general propositions that a rich man is a criminal, that a corporation is a conspiracy, and that, wherever a large combination of capital is employed in business, it is employed to rob the many for the benefit of the few.

Against these vicious propositions, in the abstract, it may be fruitless to argue, for opinions are not easy to change, but there is a concrete side of the question which must appeal to even the opinionated ignoramuses who have been deluded by the empty assertions of the propagandists. Neglecting the slanderous proposition that a rich man is necessarily a criminal, and the equally absurd proposition that a corporation is a conspiracy, the student of current affairs may meet the concrete position, that capital in business is always employed to rob the many for the benefit of the few, with substantial proof of the falsity of that theory. The record of market movement and prices is the weapon with which the student may successfully assail this pet theory of the crank legislators and of the falsificationists in general. What does that record show? Does it prove that large combinations of capital have controlled standard articles of consumption and increased the cost of those articles to consumers? Take the most notable of these combinations. The Standard Oil Company was formed in 1872, and it found the markets supplied with dear and dangerous illuminating oils. This company employed scientists, inventors, mechanics and business men, laid pipe lines, reduced the cost of package and transportation, and made illuminating oil safe. In 1873 dangerous oil sold at 25 cents a gallon, and in 1897 it sells for 6 to 8 cents a gallon. So much may be said for the one great "trust." The example of the one great "corporation," the American Sugar Refining Company, is similar. This corporation was formed in 1887. It found sugar selling at 7 cents a pound, and in 1897 it sells the same grade of sugar for 4 cents a pound. The Cottonseed Oil Trust, formed in 1884, has reduced the price of standard summer yellow oil from 48 cents a gallon in 1884 to 24 cents a gallon in 1897.

Among other capitalistic combinations are many that have similarly cheapened the products which they manipulate. The United States Rubber Company, formed in 1892, advanced prices far enough to insure a profit, but outsiders have compelled a reduction. The United States Leather Company has controlled since 1892 the sole leather output of the country, but prices have gone down until leather is selling at 17½ cents a pound, while the raw hides sell at 18½ cents a pound. The National Cordage Company smashed itself in its attempt to smash others, and its successors are now selling for 6 cents a pound the same product that sold for 10 cents a pound before the original trust was organized. The Whisky Trust, formed in 1890, found alcohol selling at $1.44 per gallon, including the revenue tax of 90 cents, and to-day it is selling at $1.16 per proof gallon, including the revenue tax of $1.10. The bituminous coal producers combined in 1896, and sold coal at $2 to $2.10 per ton, and to-day it is quoted at $1.70 per ton. The anthracite coal producers put stove coal up from $3 to $4.10, and after one year of combination they dissolved, and coal again fell in price. The telegraph companies have been denounced as "gigantic conspiracies." They formed a combination in 1866. In that year it cost $2.20 to send a 10 word message by wire from New York City to Chicago, and to-day it costs 40 cents. They have reduced the cost of such a message during thirty years proportionately to all parts of the republic. The business man in New York finds his 10 word message to St. Louis reduced from $2.25 to 40 cents, to New Orleans from $3.25 to 60 cents, to St. Paul from $2.25 to 40 cents, to Galveston from $5.50 to 75 cents, to San Francisco from $7.45 to $1, to Oregon from $10.20 to $1, and to the State of Washington from $12 to $1. The railroads of the country have likewise reduced the charge of moving a ton of freight a mile from 2·21 cents in 1873 to 0·84 cent in 1897.

Even these achievements, which are beyond dispute, do not tell the whole story. While these trusts, firms and corporations have so enormously reduced costs to the consumers of the country, they have, on the whole, increased the average of the wages which they pay to their laborers. According to the theories of the agitators, all these combinations have robbed the people of their money and their liberty, but the record shows that the combinations, like business men in general, fail in some lines and succeed in others, that they have, by making use of scientific economics, reduced the cost of all standard products to consumers, and that, instead of having robbed the people of any privileges or liberties, they themselves have been subjected to restrictive legislation in the different States and in the national council. Thus do the plain truths and facts tell against the main indictment in the charge of the demagogues against the capitalists of the land. An illustration of the trust question was furnished in the recent collapses of several conspicuous and much-maligned combinations in the metal industries. The moment these concerns dissolved, the prices of their products were cut, and they were forced either to close their establishments or to cut down the wages of their laborers enough to cover the drop in prices. This, again, was contrary to the teachings of the demagogues, who have all along insisted that in "securing to labor its just reward or remuneration," the "first and necessary step is the squelching of the capitalist." Indeed, wherever and whenever the demagogic theories collide with the commercial and industrial facts, there is a wreck, and it is never the fact that is wrecked.

Demagogic agitation will continue so long as the agitator can find men to accept their falsehoods as truths and their baseless claims as facts, but it seems probable that, with the spread of a more general knowledge of what has been accomplished by the great capitalistic concerns, agitation must become a less harmful and a less dangerous evil than it has been. —By A. B. Salom, in the American Wood-Worker.

Oscillations of a Tower.

Prof. W. Ritter gives in the Schweizerische Bauzeitung of February 13 the results of his experiments on the oscillations of a tower in Zurich produced by the ringing of bells, says the Railway Gazette. The tower, which is 39½ meters high, contains five bells, ranging in weight from 425 to 3,430 kilogrammes, and it is remarkable that the light bells produced greater oscillations of the tower than the heavy ones. The horizontal oscillations were elliptical in shape and variable in size, those produced by a bell of 705 killogrammes, which was swung fifty-three times per minute, being at a maximum 3·6 mm. long and 2·4 mm. wide, the longest axis being in the direction of the movement of the bell. When the five bells were rung at once the ellipse had a maximum major axis of 5·8 and a minor axis of 4·4 mm. The bells were swung from forty-three to fifty-seven times per minute, while the tower oscillated quite uniformly 160 times per minute. It was shown that the oscillations were felt at any point in the tower below the bells and that the amount of movement was proportional to the height above the ground. According to the principle of the conservation of center of gravity the tower tends to move in the opposite direction to that of the bell, and this movement increases until the resistance of the masonry produces equilibrium with the impulsive forces.

THE WASHINGTON MONUMENT, PHILADELPHIA.

The new Washington monument, erected at the Green Street entrance of Fairmount Park, Philadelphia, which was presented to the city by the State Society of the Cincinnati, was unveiled on May 15 by President McKinley in the presence of thousands of spectators. The statue is one of the most important and imposing monuments ever erected in the United States. In 1783 the officers of the revolutionary war, wishing to perpetuate their friendship and raise a fund for relieving the widows and orphans, organized the Society of the Cincinnati. In 1810 they began to raise a fund of $150,000 to build a monument to George Washington, but owing to the troublous times following the war of 1812 this movement was stopped temporarily. When Lafayette visited Philadelphia in 1824, the absence of any monument caused some adverse criticism, and a new fund was started which was soon forgotten, but was revived in 1832 on the one hundredth anniversary of Washington's birth. The fund of 1810 had in 1880 grown to $137,000, and the funds of 1824 and 1832 had grown into $50,000. The union of these funds, together with their further increase by investment and donation, was sufficient to pay for the splendid memorial which has just been unveiled, which cost in all $250,000. The design was made by the German sculptor, Rudolph Siemering, and represents an equestrian statue of George Washington on an immense pedestal of bronze placed on a granite platform or base. The figures and ornaments are all in bronze, and the monument as it now stands is forty-four feet high. The base of the monument is oblong in shape, 61 × 74 feet, and is built of pink Swedish granite, having thirteen steps, symbolical of the thirteen original States. At the corners are fountains representing four great American rivers, the Delaware, Hudson, Potomac and Mississippi, with allegorical figures of Indians. These fountains are guarded on either side by native animals, all in bronze. From the platform rises a

granite and bronze pedestal some seventeen feet high, while, as a crown, is a bronze equestrian statue of General Washington in the uniform of the revolutionary army. A large military cloak is thrown over his shoulders, falling well over the horse. At the front of the pedestal is an allegorical group representing America, seated, holding a trident and cornucopia. On either side is a figure, one holding a scroll, the other offering a wreath; below is an American eagle supporting the arms of the United States.

The group at the back is America showing her sons their condition of slavery, at the same time urging them to go forth and seek freedom and independence. Beneath this group are the arms of Pennsylvania. Bronze bass-reliefs are on either side of the pedestals, one representing the march of an army and the other that of a west bound emigrant train. Immediately under the statue and running around the pedestal are the words, "Erected by the State Society of the Cincinnati of Pennsylvania."

The unveiling ceremonies were most imposing. The first event of the day was firing the salute at sunrise by the batteries of the United States regulars camping in Fairmount Park. A committee of the Military Order of Foreign Wars called on the President and presented to him the insignia of the society. After a drive through the park and city the President returned to the Hotel Walton for luncheon. In the meantime the parade was forming. The parade passed through the principal streets, the President being escorted to the scene of the unveiling ceremonies by the City Troop.

The ceremonies at the monument began at two o'clock with prayer by Bishop Whittaker, of Pennsylvania. An address by Major Wayne, President of the State and General Societies of the Cincinnati, followed. The President then unveiled the figure of Washington. This was the signal for the firing of the national salute by the war vessels in the Delaware. President McKinley then made a short but excellent speech.

Our engraving is reproduced from an excellent photograph by W. H. Rau, of Philadelphia.

THE WASHINGTON MONUMENT, PHILADELPHIA.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

RAILROAD TIE MACHINE.—Alexander B. B. Harris, Bristol, Tenn. For boring and trimming the ends of metallic ties, this inventor has devised a machine, to rest on a platform car, which will take up the ties by an elevator, finish them, and discharge them, the machine and its engine and boiler being seated on a turntable, so that it may take up and discharge the ties from and to either side of the track. The machine is an improvement on a former patented invention, and planes off the tie to form level, flat seats for the tie plates, at the same time boring holes to receive thimbles of the tie plate and their expanding spikes, and trimming off the ends of the tie to a uniform length and square finish.

STEEP GRADE CAR BRAKE.—Edward Maginn, Pittsburg, Pa. According to this invention a broad, flat, strongly made wooden shoe, of practically the same length as the car, is suspended between the rails, to be lowered into frictional contact with the street surface when desired, and elevated and held suspended without much difficulty. As the shoe falls and is locked in position by pawls the weight of the car and its load is imposed on it, suddenly arresting a car on the steepest grade. The ends of the shoe are rounded, and it is intended they shall project far enough to adapt them to serve as fenders for picking up pedestrians who may fall in front of a car.

Electrical.

ELECTRO PNEUMATIC ORGAN ACTION.—Hermann E. Hobbs, Weston, Mass. For use on electric organs this inventor has devised an improvement to permit the employment of a comparatively weak current to indirectly control the exhaust valve. It comprises a wind chest and a chamber connected with it by ports, there being a pneumatic-controlled exhaust valve for the chamber, and an electro magnet whose armature forms a valve for controlling the inlet ports. The valve also controls a leak passage leading from the chamber, and a key is adapted to open and close the circuit for the electro magnets.

ELECTRODE.—Wilhelm Majert, Falkenberg, Germany. In electrodes for storage batteries, this inventor provides an electrode which will not warp or crack, and in which the frame will preserve its original shape. The conducting frame is made with inwardly projecting flanges forming an interior groove, the inner portion of which is occupied by a soluble substance, while the outer portions of the flanges embrace the filling of active mass or paste, the result being that as the mass expands in forming the battery a proper space is allowed to prevent bending or buckling of the frame, the soluble substance being afterward removed by washing the electrode in water.

Mechanical.

BOX NAILING MACHINE.—Paphro D. Pike, Stowe, Vt. For forming and nailing circular boxes for butter, etc., and their covers, this inventor provides a machine by which the rim may quickly turned around and nailed to the bottom portion, and the overlapped ends quickly tacked together. The machine comprises a rotary former and means for holding the bottom of a box in contact with it, a nail carrier with a series of spring-pressed nail holders on its outer side, and a tack holder extending transversely of the carrier, there being also guides for the box material extended above the former and a cutter adapted to operate across the former.

Agricultural.

HAY TRUCK.—Octavus E. Adolph, Bosial, Denmark. After the hay has been raked together by hand, or with a horse rake, it is, according to this invention stacked upon a truck as the latter is driven along the rows of hay lying on the field, the truck having a slightly inclined bottom, and being so arranged that it can be readily inclined at will, the truck being afterward withdrawn from underneath the stack, which will thus be deposited without changing its form. The truck has a frame supported by two pairs of low wheels, and on an extended back portion is a smaller pair of wheels not ordinarily touching the ground, and doing so only when the truck is tilted to deposit the stack.

CUTTER FOR HAY STACKS.—Hilary J. Twiss, Baker City, Oregon. This cutter is composed of a number of cutting blades detachably connected by links to form a chain of cutters, at each end of which is a handle. In operation the chain of cutters is thrown over a hay stack or rick, when each handle is grasped by an operator and the chain laterally reciprocated as would be a crosscut saw until the stack has been divided as desired into sections suitable to feed from or for forking off the hay.

Bicycles, etc.

SPEED INDICATING ALARM.—Leon G. Anthony, Salt Lake City, Utah. The indicator of this alarm is so arranged that after it is set to indicate a predetermined speed an alarm will be given when such speed is exceeded, thus notifying the rider, the alarm continuing to sound until the speed is reduced. The indicator may be attached to the fork of a bicycle, and has a wheel adapted to engage the tire, and pivoted spring-restrained levers adapted to be swung outward under the influence of centrifugal force to strike a fixed gong. The tension of the spring is regulated by a nut, according to the speed at which the indicator is to be set.

WHEELED VEHICLE.—Emil H. Schellack and Frank Ridenour, Fort Dodge, Kansas. This invention is for a vehicle having three or more wheels and a box body, to be propelled by the rider placing his feet on foot pieces and grasping the hand pieces of vertical plungers, to be alternately raised and lowered by the action of the rider throwing his body from side to side and exerting his weight on the plungers as well as on the treadles. The foot power mechanism and the hand power mechanism engage different sets of cranks on the same shaft, and the machine may be operated either by hand or foot power alone, or by both, the latter method of propulsion being designed to afford great speed.

LAMP BRACKET.—Joseph M. Brown, Nanaimo, Canada. A bracket which may be readily secured to or removed from the frame is provided by this invention. It consists of a band of sheet steel, preferably lined with rubber or cloth, and adapted to engage the steering head or other part of the bicycle, the ends of the band being shaped as eyes, in each of which is a spring tongue, adapted to engage a shoulder or notch in a depending leg of a bracket adapted to engage the lamp. The device is simple, strong and light, and has no lugs, bolts or hinges, being simply sprung into place and as readily removed.

Miscellaneous.

TYPEWRITING MACHINE.—Edward N. Chamberlain, Natchez, Miss. A mechanism is provided in connection with this machine whereby a bill head or letter head may be stamped on the paper before writing upon it, the machine being thus designed to save the expense of printed stationery. The machine is also provided with an adding device, whereby amounts may be quickly added by operating the keys and then impressed upon the paper. Both the adding and letter head printing devices may readily be disconnected, and the machine easily operated as a rapid typewriter of the most improved form.

STAMP AFFIXING MACHINE.—Stephen W. Aldrich and Winfield L. Dinsmoor, Portland, Oregon. This invention is for an improvement on a former patented invention of the same inventor, and provides a machine for applying stamps to envelopes or other packages to be mailed, the machine being operated by one hand, leaving the other hand of the operator free for the manipulation of the packages to be stamped. The present patent covers such improvement in the construction of the machine as is designed to render automatic the entire operation of affixing the stamps.

BOOT OR SHOE STRAP.—George E. Shoop, Golconda, Ill. This strap is made of strips of any suitable material laid one upon the other and secured together at their side edges, and a strip of rubber located between the strips, thus constituting a strap which will always remain sufficiently open to admit of the ready and convenient introduction of a finger. The inserted elastic material, acting as a spring, holds the loop of the strap open at all times.

SPRING BED AND FRAME.—Edwin R. Weber, New York City. For use particularly in connection with a metal bedstead, this invention provides a construction whereby the frame may be adjusted to slight variations that are found in the making of the head and foot boards, and also provides simple supporting devices for the springs to prevent them from being bent inward.

PUZZLE.—Joseph H. McCarville, Centerville, Iowa. This puzzle comprises a circular board, in the glass covered top of which channeled letters are supported and adapted to be moved into different positions by means of a pointer inserted in openings at the sides, there being also used in connection with the letters sixteen silver colored balls and one gold colored ball. Some of the channels in the letters are closed and some of them are open, and a puzzle is thus made which is designed to call for considerable skill in properly solving it.

STOVE SCRAPER AND BRUSH.—William J. Crutcher, Logan, West Va. To facilitate drawing the dust, ashes and soot from the flues of a stove, this invention provides a special form of adjustable brush, whose plane may be conveniently changed for insertion flatwise through a slot in the stove and then turned to a position at right angles, whereby it not only presents a broad surface like a hoe to make a scraper, but is armed with bristles along its edge to thoroughly clean the walls of the flue and sweep out the accumulated deposits.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS, ETC.

SMITHSONIAN MISCELLANEOUS COLLECTIONS, 1038. Smithsonian Physical Tables. Prepared by Thomas Gray. City of Washington: Published by the Smithsonian Institution. 1896. Pp. xxxiv, 301.

We cannot characterize this extensive series of over 900 tables by any treatment adequately expressing its completeness. They are due to Prof. Thomas Gray, of the Rose Polytechnic Institute, Terre Haute, Ind. It is questionable if the Smithsonian Institution ever contributed a work of greater merit and of more immediate use, one which will be in more constant use by any one ever having occasion to employ scientific data. Our only excuse for not reviewing it thoroughly must be that it does not lend itself to such review. We give it our warmest commendation. The ground covered includes conversion factors for every imaginable class of date, including nearly forty tables; values of logarithms of physical and electrical constants, and complex factors, wire data for different metals, strength of materials, gases, specific gravities, velocities of sound, gravity determinations, terrestrial magnetism, and any quantity of other matter, in 315 tables. The introduction is devoted to preliminary definitions and in itself is worthy of every commendation, its clearness of statement and ground covered making it an admirable refresher for one whose general physics need a little reviving. As an example of a definition, we would refer to that given on page xxi, for force, as specially indicative of the value of the author's work.

SMITHSONIAN MISCELLANEOUS COLLECTIONS, 1075. The Constants of Nature. Part V. A Recalculation of the Atomic Weights. By Frank Wigglesworth Clarke. New edition. Revised and enlarged. City of Washington: Published by the Smithsonian Institution. 1897. Pp. vi, 370.

In line with the above is Prof. Clarke's exhaustive contribution to our knowledge of atomic weights. It is an excellent model of the best work of the modern chemist, and is now the authoritative treatise on its subject. The amount of labor which the compilation represents is very great; it is something which can only be appreciated by the scientific writer. It was as early as 1877 that Prof. Clarke, who is chemist of the United States Geological Survey, began his work on atomic weights, and during the next few years various treatises appeared, so that at last the present volume was determined on and was issued. This final table for practical use is especially interesting, two sets of figures being given, one for H=1 (or oxygen=15·88); the other for O =16 (or H=1·006).

SIXTEENTH ANNUAL REPORT OF THE UNITED STATES GEOLOGICAL SURVEY TO THE SECRETARY OF THE INTERIOR. 1894–5. Charles D. Walcott, Director. In four parts. Part I. Director's report and papers of a theoretic nature. Washington: Government Printing Office. 1896. Pp. xxii, 910.

This volume of monographs is an admirable example of the work which the United States Geological Survey is doing. It contains, in addition to the general report of the director, in which the detail work of the year is treated, monographs on geological subjects, such as Glacier Bay, Muir Glacier, the Dinosaurs of North America, and the Pre-Cambrian rocks in America, the flow and fracture of rocks, the latter especially interesting because a general subject. The making of the book is expensive; it is a most beautiful piece of printing. Almost the only suggestion we would make would be that the illustrations in some cases seem hardly good enough for the sumptuous make-up of the rest. This, however, must not be accepted as a criticism on the illustrations. It is rather a testimony to the rest. It would seem hard to believe that any department of the government is doing better work than that indicated by the volume under consideration.

NOTES ON ASSAYING. By Pierre de Peyster Ricketts and Edmund H. Miller. First edition, first thousand. New York: John Wiley & Sons. London: Chapman & Hall, Limited. 1897. Pp. viii, 311. Price $3.

Dr. Ricketts' work on assaying has been known to many successive classes in assaying courses, especially to students of Columbia University. The present work is a vast improvement on the previous work by the same author. A very extensive index and numerous tables, the treatises on blowpiping and on the sampling of ores and the preparation of the same for the assayer extending its value very largely. Of course, to the Columbia University student it is a sine qua non; to others it will be found of interest and value. In some respects we should have been glad to find it more exact. Thus the calculation for silver and gold ration, nominally 1: 16, is really about 1: 15·98, but the first and popular rendering is given by the author. Then in the hardness series, as No. 8, there is given the mineral "ruby (spinel)." Everyone who thinks of the ruby almost always thinks of the corundum ruby, although of course both terminologies are correct. As a matter of preference, we should have preferred to see the term ruby used for No. 9, instead of sapphire. To those who want to do assaying we warmly commend the work as thoroughly practical.

THE MATERIALS OF CONSTRUCTION. A treatise for engineers on the strength of engineering materials. By J. B. Johnson, C.E. First edition, first thousand. New York: John Wiley & Sons. London: Chapman & Hall, Limited. 1897. Pp. 771. Price $6.

The author is professor of civil engineering in Washington University, St. Louis, Mo., and for a long time has been recognized as an authority upon engineering, and especially on that branch of engineering which forms the subject of the present work. The value of data concerning the strength of materials was recognized away back in the fifteenth century, by Leonardo da Vinci, but the germ of the science remained latent until the present century. The materials of construction and the rational testing of them may be regarded as one of the most important functions of the engineer, as upon them rest very largely the success or failure of the vast constructions which often involve millions of property and hundreds of lives. The author offers to his readers a condensed and concise summary of such portions of the subject as he found suitable for such a work. It is arranged so that it may be used both as a text book for the student and a manual for the engineer. The general nature of the formation of stresses is taken up, together with the various varieties of such stresses. The manufacture and general properties of materials of construction are next considered, with chapters on cast iron, wrought iron, steel, cement, brick, timber, etc. Great attention is given to testing machines and the means of testing the materials of construction. This section of the work is of special value. The third part takes up the mechanical properties of the materials of construction as revealed by actual tests. The book is illustrated with 635 engravings and diagrams in addition to 11 plates. It can be commended as a thoroughly scientific treatise on a very important subject.

Marine Engineering is a new periodical published by the Marine Publishing Company, World Building, New York City. The first number of this new paper has just come to hand. It has been thought for a long time there was a good opening for a high class monthly devoted to marine engineering, with special reference to American shipbuilding. The first number is a very creditable example of trade journalism. It is illustrated with half tones and line drawings. The subscription price is $2.

The American Bakers' and Confectioners' Journal is published at 500 Pearl Street, New York City, and is devoted to everything regarding the bakery and confectionery business which is likely to be of even passing interest. The larger part of retailers in the bakery and confectioners' trade are Germans and the paper is printed in both English and German. The subscription price is $1.50 per annum.

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The Temperly Transporter.

See illustration, front page of SCIENTIFIC AMERICAN, April 24. It is manufactured by the Lidgerwood Mfg. Co., 96 Liberty Street, New York. Write for particulars.

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(7164) O. L. O. asks: 1. Can an arc light dynamo be used for depositing metal in electrotyping? A. It cannot be used as specified, except at the greatest disadvantage. The current is small and resistance high. 2. Can a current, either incandescent or arc, be so used direct from a line or circuit (I mean from the light wires in the cities) without any further use of another dynamo? A. The same is to be said for this case. The incandescent current can be used to operate a motor, and the latter can drive a plating dynamo.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

MAY 25, 1897,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Air and steam in any proportions, apparatus for mixing compressed, A. E. Thomine	583,240
Air brake, automatic, G. A. Boyden	583,278, 583,279
Amalgamator, F. B. Austin	583,254
Amusement wheel, H. H. Pattee	583,121
Animal trap, T. M. Hovell	583,277
Anti-incrustation compound, Borecky & Komestik	583,023
Atomizer, W. L. Stevenson	583,341
Autoharp, C. F. Zimmermann	583,162
Automatic switch, Elliott & Kostner	583,304
Axle spindle, C. A. Ferguson	583,195
Band cutter and feeder, M. S. McCoy	583,073
Bank officials, device for protecting, P. G. Schlosser	583,238
Barrel or package register, Friedman & Engert	583,111
Bath tub, M. C. Mengis	583,066
Batteries, method of and apparatus for charging storage, C. C. Bramwell	583,323
Bearing box, pitman, W. D. Davis	583,196
Bearing, vehicle roller, A. W. Grant	583,050
Bed bottom, J. M. Brown	583,025
Bed bottom, A. H. Viel	583,315
Bed, folding, F. P. Bailey	583,164
Beer cooling device, C. Reiler	583,070
Bell, bicycle, S. W. Wardwell, Jr	583,348
Bicycle, J. A. Marikle	583,149
Bicycle, M. T. Smith	583,340
Bicycle brake, L. H. Flory	583,258
Bicycle brake, P. Helmon	583,371
Bicycle dress guard, Taylor & Wright	583,313
Bicycle frame, T. H. Bolte	583,022
Bicycle frame, wooden, J. Gilbert	583,356
Bicycle gear casing, J. D. Farmer	583,144
Bicycle handle bar, adjustable, O. A. Wheeler	583,305
Bicycle lock, F. E. Ga Nun	583,174
Bicycle lock, R. W. Miller	583,291
Bicycle or like vehicle, C. L. Travis	583,345
Bicycle pedal, E. S. Richards	583,086
Bicycle rack, coin controlled, H. Westphal	583,410
Bicycle repair ping and means for inserting same, J. L. Hatch	583,438
Bicycle saddle, J. F. Hall	583,423
Bicycle, safety, F. D. Owen	583,078
Bicycle steering lock, safety, R. W. Smith	583,130
Bicycle wheel, F. A. Redmon	583,124
Binder for ledgers, loose leaf, J. P. Boehner	583,244
Board walk and breakwater, interchangeable, F. M. Ironmonger	583,056
Boat, hunting, J. Danz, 2d	583,053
Bolt cutter head, M. D. Luehrs	583,067
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Bottle, non-refillable, P. C. Thompson	583,241
Bottle stopper, W. J. Cunningham	583,211
Bottle stopper, Jursutz & Bollenbach	583,442
Brake. See Air brake. Bicycle brake. Carriage safety brake. Fluid pressure brake.	
Brake beams, machine or tempiet for setting up and camboring trussed metallic, W. Adams	583,163
Brake beams, strut for trussed, C. Hoyle	583,055
Brush, rotary, T. Brown	583,390
Buggy top raising or lowering device, J. A. M. Tyler	583,236
Building frame, metallic, F. E. Pomeroy	583,230
Bulletin board, M. Petry	583,417
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Burner. See Gas burner. Liquid fuel burner. Oil burner.	
Cage safety apparatus, L. Rossler	583,125
Cake cutter and mould, L. Eckel	583,301
Cake turner, griddle, O. E. Mickel	583,068
Calculagraph, H. Abbott	583,320
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Cane, automatic mechanism for unloading and feeding sugar, J. Mallon	583,408
Cans, folding support for, F. G. Creeth	583,051
Car bell operating mechanism, J. T. Haskins	583,305
Car coupling, H. H. Draper	583,172
Car coupling, D. Golden	583,303
Car coupling, A. F. Kuhlmann	583,380
Car coupling, C. Lee	583,186
Car coupling, H. M. Luchia	583,115
Car coupling, R. Yetsley	583,106
Car doors, means for operating, N. Barney	583,019
Car fender, W. Bailey	583,017
Car fender, S. C. Bole	583,393
Car fender, T. Curley	583,170
Car fender, J. Enright	583,294
Car fender, C. A. Hatch	583,146
Car fender, Jorasutz & Bollenbach	583,441
Car partition, stock, J. M. & W. Blue	583,321
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Carbon making machine, T. B. Dooley	583,266
Carburetor, B. L. Ryder	583,126
Carousel, electric race horse, J. W. Daniels	583,109
Carriage safety brake, child's, Parrett & Fogg	583,079
Cash carrier apparatus, pneumatic, L. G. Bostedo	583,246
Cash recorder, manual, H. M. Geiger	583,367
Cash register, indicator and adding machine, G. O. Brager	583,192
Casting metals, A. M. Acklin	583,424
Cathode for electrolysis, E. A. Georges (called C. Street)	583,255
Chain, bicycle sprocket, H. M. Caldwell	583,167
Chain, drive, E. F. Morse	583,151
Chain, driving, E. F. Morse	583,150
Chair. See Folding chair. Knockdown chair.	
Chair and bed, convertible, J. S. Holman	583,179
Chuck, universal, V. A. Sallot	583,127
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Churn and butter worker, combined, F. B. Fargo	583,143
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Cooler. See Milk cooler.	
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Corset fastening device, C. J. Holmgren	583,308
Coupling. See Car coupling. Pipe coupling. Pipe joint coupling.	
Cultivator, three-row, T. S. Warner	583,272
Cutter. See Band cutter. Cake cutter. Paper cutter. Potato cutter. Rack cutter.	
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Dam construction, F. A. Gartner	583,226
Dental rubber, I. B. Kleinert	583,307
Detergent compound, H. J. Ennis	583,431
Distilling ammonia, process of and apparatus for, H. J. Krebs	583,262
Door securer, J. S. Batcheider	583,108
Door securer, P. Dunwald	583,362
Doors and gratings, system of pneumatic, E. S. Corbett	583,405
Doors, apparatus for automatically closing or opening, A. von der Ropp	583,155
Dovetailing machine, D. Lynn	583,383
Drawer rest, sliding, F. Hamilton	583,228
Dredging apparatus, F. E. Younge	583,319
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Drill. See Electric drill. Seed drill.	
Drill, T. Carrigg	583,358
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Electrolysis, process of, E. A. Le Sueur	583,330
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End gate fastener, N. Kirchner	583,198
Engine. See Gas or vapor engine.	
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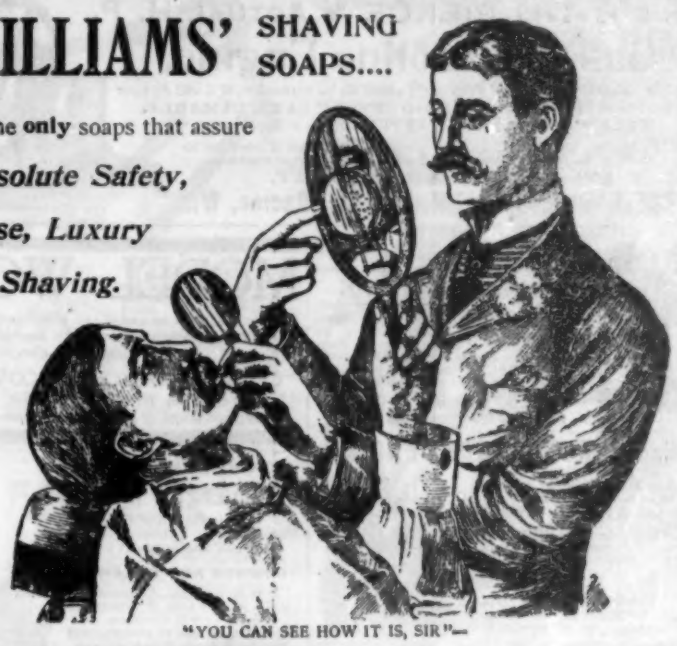

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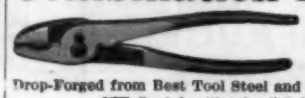

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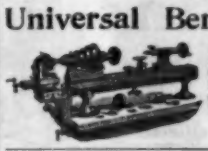

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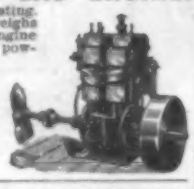

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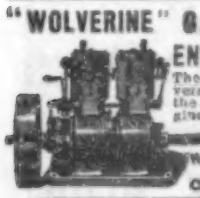

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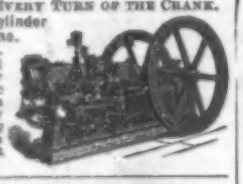

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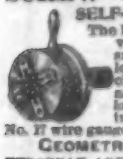

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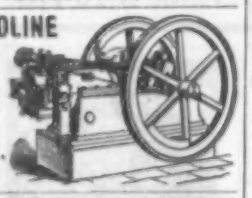

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Wagon bed scoop board, J. Gross	588,051
Wagon, dumping, T. Hill	588,373
Washing machine, D. E. Wellman	588,191
Water heater, J. C. Beckheid	588,275, 588,276
Watering apparatus for stock, etc., automatic, J. Kirkwood	588,361
Wheel. See Amusement wheel. Bicycle wheel.	
Whiffletree, J. B. Sargent	588,337
Wind instrument, G. Oliveri	588,077
Window, sliding, J. C. Hood	588,375
Wire coupling and binding post, J. A. Wright	588,342
Wire, device for spooling and unspooling barbed, M. K. Pharies	588,393
Wire, machine for inserting screw threaded, L. H. Goddu	588,045
Wrench, R. S. Sample	588,217
Wrench, S. W. Wardwell, Jr	588,346, 588,347

DESIGNS.

Ash box, L. Kahn	27,110
Bedstead rail or spindle, W. Hess	27,103
Bicycle frame, C. E. Duryea	27,091
Brushes, etc., handle for, F. R. Stafford	27,090
Button hooks, etc., handle for, F. Thielke	27,100
Car bolster tension member, W. H. Marshall	27,125
Carpet, G. W. Bartlett	27,122
Carpet, J. C. Fulton	27,121,
Carpet, J. Gray	27,136
Carpet, H. W. Parton	27,124
Carpet, G. J. Steugel	27,123
Ceiling plate, etc., G. A. & E. D. Forman	27,117,
Chain, W. C. Edge	27,087
Coin actuated wheel casing, W. S. Graham	27,101
Corner brace, C. H. Cramer	27,105
Display stand, Kraft & Mauerman	27,108
Dynamo frame, G. S. Dunn	27,098
Furnace, hot air, G. O. Bergstrom	27,113
Game board, H. A. Mahood	27,119
Glass dish, W. Marrett	27,116
Handkerchief, T. Burkhard, Jr	27,120
Ice hook, T. S. & E. K. Hiles	27,095
Monument, W. H. Young	27,115
Nut cracker, C. Collins	27,093
Razor handle, M. C. Lefferts	27,092
Screen, G. W. Cross	27,114
Spoon, W. C. Codman	27,088
Spoon, C. G. Tingry	27,089
Stove door or panel, L. Kahn	27,111
Stove, heating, L. Kahn	27,112
Switch blade, electric, W. S. Hill	27,097
Syringe nozzle, J. F. Wetherald	27,096
Tile, A. H. Bonnell	27,109
Truck bolster, T. Thompson	27,099
Tube bushing, C. F. Mellink	27,104,
Washing machine plate, F. E. & H. W. Whipple	27,102
Watch or clock dial, H. H. James	27,094

TRADE MARKS.

Beer and porter, Minneapolis Brewing Company	30,099
Bicycles, Adams & Hart	30,101
Bicycles and parts thereof, American Cycle Manufacturing Company	30,102
Bicycles and parts thereof, Scott Paper Company	30,103
Bicycles, velocipedes, and parts thereof, Remington Arms Company	30,104
Butter, creamery, W. P. Sumner	30,098
Capsules, urethral, F. C. Fowler	30,083
Cartridges and cartridge shells for small arms, Winchester Repeating Arms Company	30,074
Cotton goods, ducks, drills, denims, shirtings, sheetings, and prints, Kunhardt & Company	30,072
Hair and scalp, preparations for the, J. Armstrong & Son	30,080
Jute bags, Ames & Harris	30,071
Lamps, bicycle, J. M. Scott	30,105
Liniment, Cecconello & Canapa	30,081
Lithia, Waukesha, and Waukesha lithia water, Waukesha Water Company	30,088
Medicinal chemicals acting as internal and external astringent disinfectants, Firm of E. Merck	30,073
Medicinal purposes, effervescent granules for, Armstrong Manufacturing Company	30,087
Oats and oatmeal, rolled, Muscatine Oat Meal Company	30,096, 30,097
Painting color and varnish, Firm of G. Briegleb	30,076
Pills, G. Arditto	30,082
Powder for the cure of rheumatism, A. M. F. Gianelli	30,084
Preparation to avert perspiration, W. Karpinski	30,079
Pulleys, sash, Norris Sash Pulley Company	30,090
Remedy for diseases of the urinary organs, Rigaud & Clermont	30,086
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Stoves, heating, Wonder Manufacturing Company	30,100
Tobacco, plug chewing, Drummond Tobacco Company	30,091 to 30,094
Varnish, Patterson-Sargent Company	30,077
Watches, watch cases and movements, T. Zurbrugg	30,073
Whisky, Jesse Moore-Hunt Company	30,080

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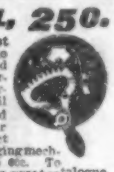

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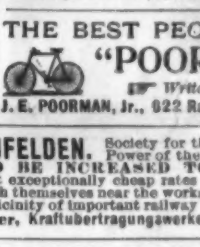

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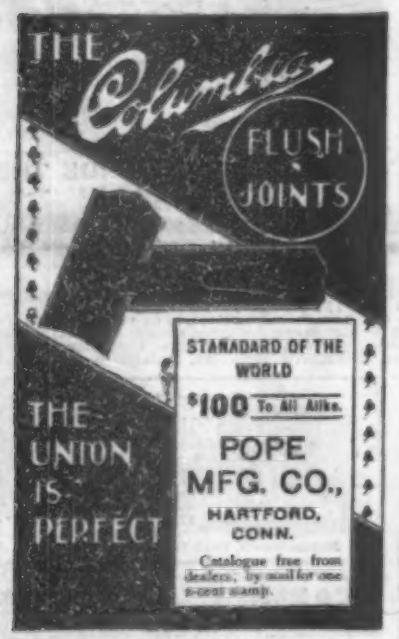

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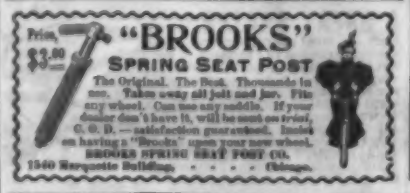
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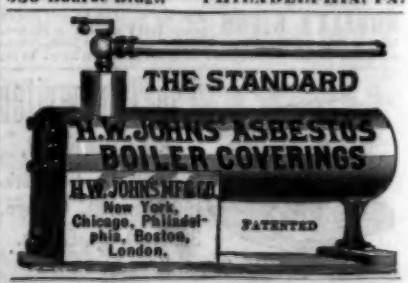

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